A COMPUTER SYSTEM FOR MENU EVALUATION AND RELATED APPLICATIONS

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SUMMARY

As part of the Uniform Ration Cost System study, a computer-based menu evaluation system was developed. The objectives of this system are:

1. To provide a tool for evaluating various food allowance and costing concepts;

2. To provide a means for analyzing cyclic menus for cost, nutrition, and food preference; and,

3. To examine the concept of using an entire menu as the basis for a food cost index.

A standard set of recipes, the Armed Forces Recipe Service, along with Federal Supply Catalog food item information (Group 89) have been automated for rapid access and computational ease. The system can analyze entire menus on a meal-by-meal and day-by-day basis, as well as perform evaluations of the recapitulation of any menu. The flexibility of the system allows for the analysis of "standard menus" and local installation menus.

A common data base has been developed that can be accessed with the developed computer software to provide cost, nutritional, and preference information on the recipes available in military food service systems. This system represents a working example of the application of computer software to food service operations and could become the basis for a larger food service information system providing assistance to food service management in the menu planning and food costing operations. The system also has applicability in current and future Department of Defense Food Research, Development, Testing, and Engineering Programs, particularly in the areas of nutritional intake studies, menu evaluation studies, and related food service system studies.

ACKNOWLEDGEMENTS

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TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

Page

LIST OF TABLES

Page

INTRODUCTION

During Fiscal Year 1974, the Operations Research/Systems Analysis Office conducted an investigation aimed at developing a Uniform Ration Cost System (URCS) under Task 01 of Project No. 1T762713AJ45, Identification of Existing Feeding Systems, System Components and Alternatives, of the Department of Defense Food Research, Development, Testing and Engineering Program. The objectives of this effort were to develop and evaluate a ration cost system which would be directly related to known consumer requirements, including the derivation of a supporting method for the computation of a recommended Basic Daily Food Allowance; to define a more flexible food service management system which would be more responsive to feeding requirements in military food service and to innovations and new technology in the food and food service fields; and to develop effective procedures for a cost-benefit evaluation of such proposed changes in food service systems. Included within these major tasks was a sub-task to develop a data base and computer software system that could be used for several purposes:

1. The analysis of preplanned cyclic menus for cost, nutrition, and relative response to stated consumer food preferences.

2. The evaluation of different levels of feeding within the military and selected industrial food service systems.

3. The evaluation of new ration cost system alternatives, including the examination of new alternatives to the derivation of a food cost index. A system that can easily analyze a whole menu for cost, nutrition, and food preference could also be used to generate the best menu from a food preference viewpoint. The recap of this "best" menu would then be a food cost index.

This report documents the computer system and presents the applications within the Uniform Ration Cost System Program. The report has been divided into two sections: SECTION I - GENERAL SYSTEM DESCRIPTION is an executive summary of the computer software capabilities and SECTION II - SYSTEM DOCUMENTATION is programmer/user oriented. SECTION I presents a summary of the system with emphasis placed on the products that can be obtained, while SECTION II contains a more detailed discussion of the system programs, files and data base construction.

The Service Requirement Identification is USN 2-I, Uniform Ration Cost System.

SECTION I

GENERAL SYSTEM DESCRIPTION

SYSTEM OBJECTIVES

The primary objective of the Uniform Ration Cost System (URCS) program was to develop a uniform food allowance and cost system that was more responsive to consumer preferences and changing technology. The improved food cost system would include development of an improved food cost index (FCI) which would be used to compute the basic daily food allowance for the military enlisted person.

Several other sub-tasks within the URCS program were initiated to develop and evaluate alternative approaches to the determination of the basic allowance and the methods of computing its monetary value. There were numerous alternatives that came under examination and are all documented in other reports from the URCS program.

At an early stage in the URCS program a requirement was initiated to develop a computer software system to provide a quantitative basis for evaluating alternatives to aid in the selection of a preferred approach to the basic food allowance and cost computation. The objectives of this computer system were:

1. To develop an efficient evaluation system with an associated data base that would be used to evaluate alternative concepts for the basic food allowance.

2. To consolidate all the available data relative to food item cost, nutritional values, and food preference into one system.

3. To design and develop an operating system that could become the basis for a new ration cost system and food planning management information system within DoD. This new system would allow DoD to consider the alternative of using an entire menu as a basis for a food cost index.

SYSTEM OVERVIEW

System Applications

Within the URCS program specific applications for the system were generated. Initially there were three application areas where the system was employed. The first was the development of menu evaluation techniques that would generate cost, nutrition, and preference ratings of menus entered into the system. The second major application area encompassed the techniques used for the analysis of food consumption and food cost indices for cost and nutrition. The development of new techniques to measure total menu preference comprised the third application area. The effort undertaken in this last area is documented in a separate URCS report, "A System for the Preference Evaluation of Cyclic Menus," U.S. Army Natick Laboratories Technical Report 75-46-OR/SA.

Within this report the discussions will be limited to the first two of the above application areas even though other applications and "spin-offs" from the system are constantly appearing in the course of other ongoing research projects. The sections that follow present the data base design considerations, the two functional areas within the system, and the system reports designed for the applications mentioned above.

Design Considerations

The system was developed at U.S. Army Natick Laboratories on a UNIVAC Model 1106 Computer. Emphasis was placed on developing the requirements of the system and then designing the file structures and operating software to meet these requirements. The primary computer language used was COBOL since file manipulation was the major consideration. The data files were maintained on mass storage with random access search techniques employed.

Data Base

The data base is structured to provide for efficient retrieval of information and includes two hierarchal levels and two distinct formats of data presentation.

A schematic of the three major files comprising the data base, (1) Detail Recipe Ingredient file, (2) Master Food Item file, and (3) Master Recipe file, is shown in Figure 1. After files (1) and (2) are created from data on card decks, the Master Recipe file is generated by an updating program. The two levels of detail maintained within the data base include the summary level data in the Master Recipe file and the detail ingredient data in the Detail Recipe Ingredient file. Data is indexed and stored by individual food item

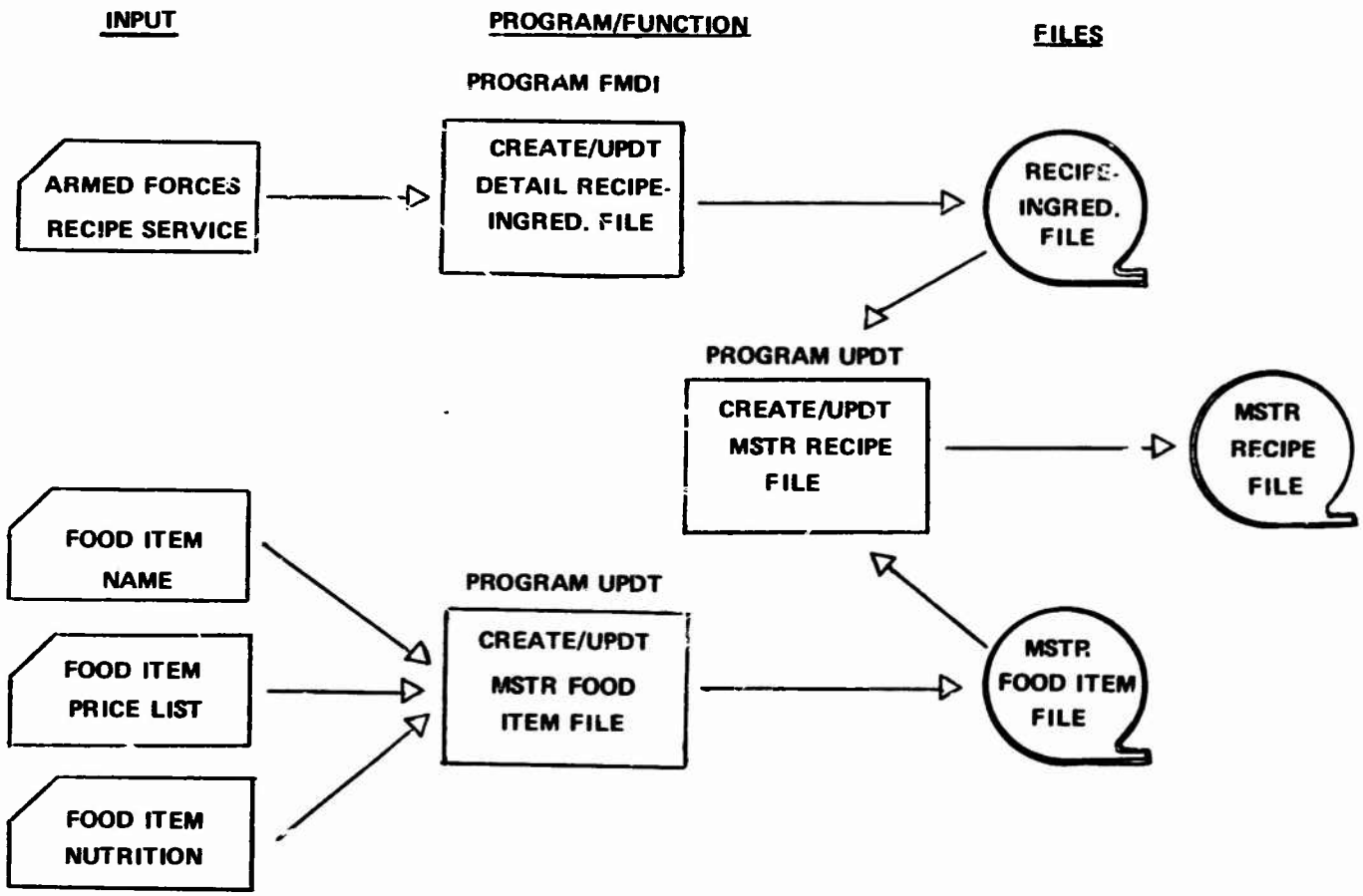

FIGURE 1: DATA BASE CREATION & SYSTEM FILES

(e.g., "beef, ground") in the Master Food Item file, and by recipe number and name (e.g., L0220-"beef stew") in the Master Recipe file. The data stored and updated within the data base include:

1. For each individual food item:[1] food item name, federal stock no., cost/pound, date of latest price change, unit of issue (conversion factor), nutrient values/pound,[2] and food class designation. (See Table 3 for Food Class Listing).

2. For each recipe in the system: recipe name and recipe number from the Armed Forces Recipe Service,[3] portion size, cost/portion, nutrient values/portion, and preference ratings (hedonic & frequency values).[4]

System Functional Areas

The system as designed and developed is segmented into two functional areas for ease of data handling and to effect a more efficient operation. The two functional areas are (1) file maintenance and updating programs and (2) menu and food item analysis programs.

The file maintenance programs create the three major files and include routines to update them as required. Figure 1 shows the flow of information in this functional area.

The second functional area includes all the menu and food item analysis programs employed in the URCS program. Systems flow diagrams for these programs are shown in Figures 2 and 3. These show the system input, the files acted on, the functions performed, and the system output for the major programs within the analysis section.

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1. Data obtained from Federal Supply Catalog, C8900 - SL.
2. Nutrient values include Food Energy, Protein, Fat, Calcium, Iron, Vitamin A, Thiamine, Riboflavin, Niacin, and Ascorbic Acid, which are contained in Defense Supply Agency Handbook 1338.1, Composition of Foods Used by the Armed Forces, May 1964.
3. Contained in the following publications: Army Technical Manual 10-412; Navy Supply Publication 7; Air Force Manual 146-12; Marine Corps Order P10110.16B.
4. Data obtained from Meiselman,H. L., et al., The 1971 Fort Lewis Preference Survey, U.S. Army Natick Laboratories, Natick, MA, TR 72-43, January 1972.

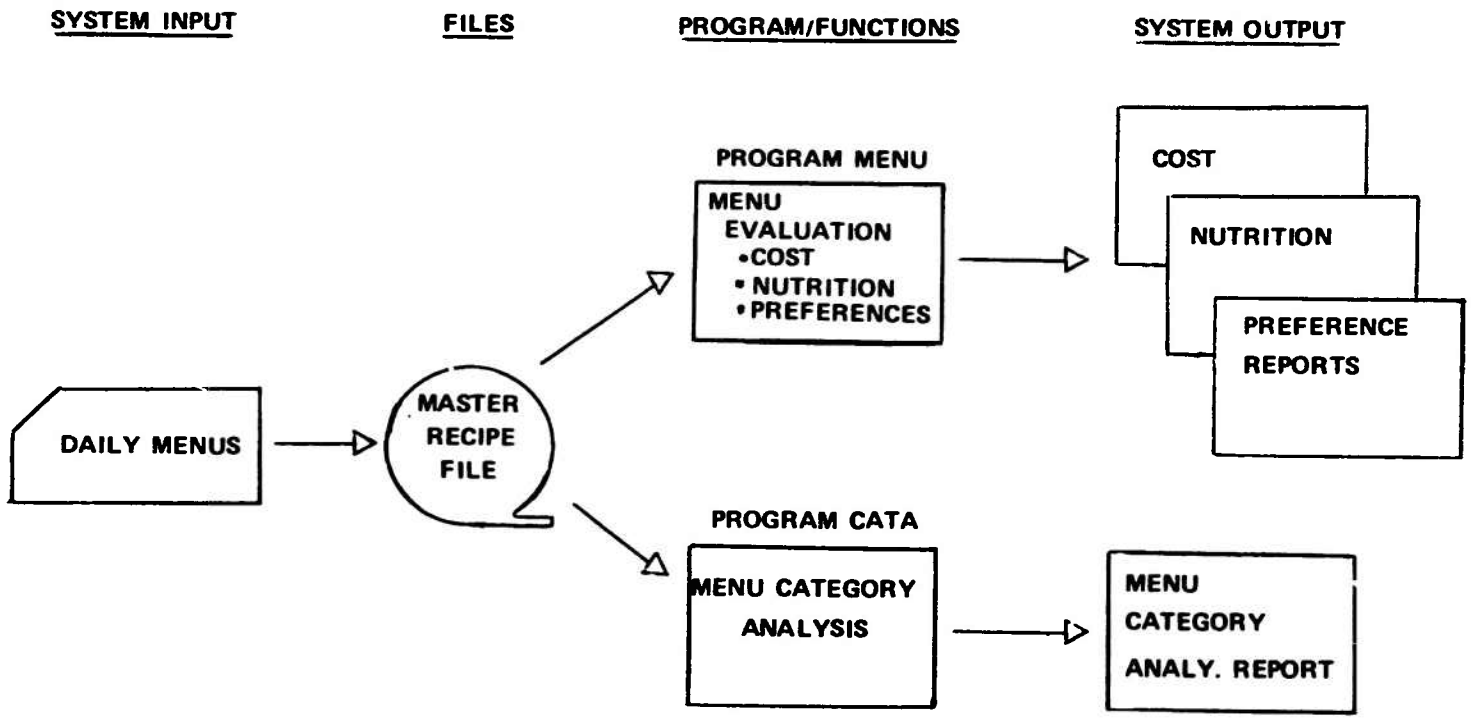

FIGURE 2: MENU ANALYSIS DATA FLOW

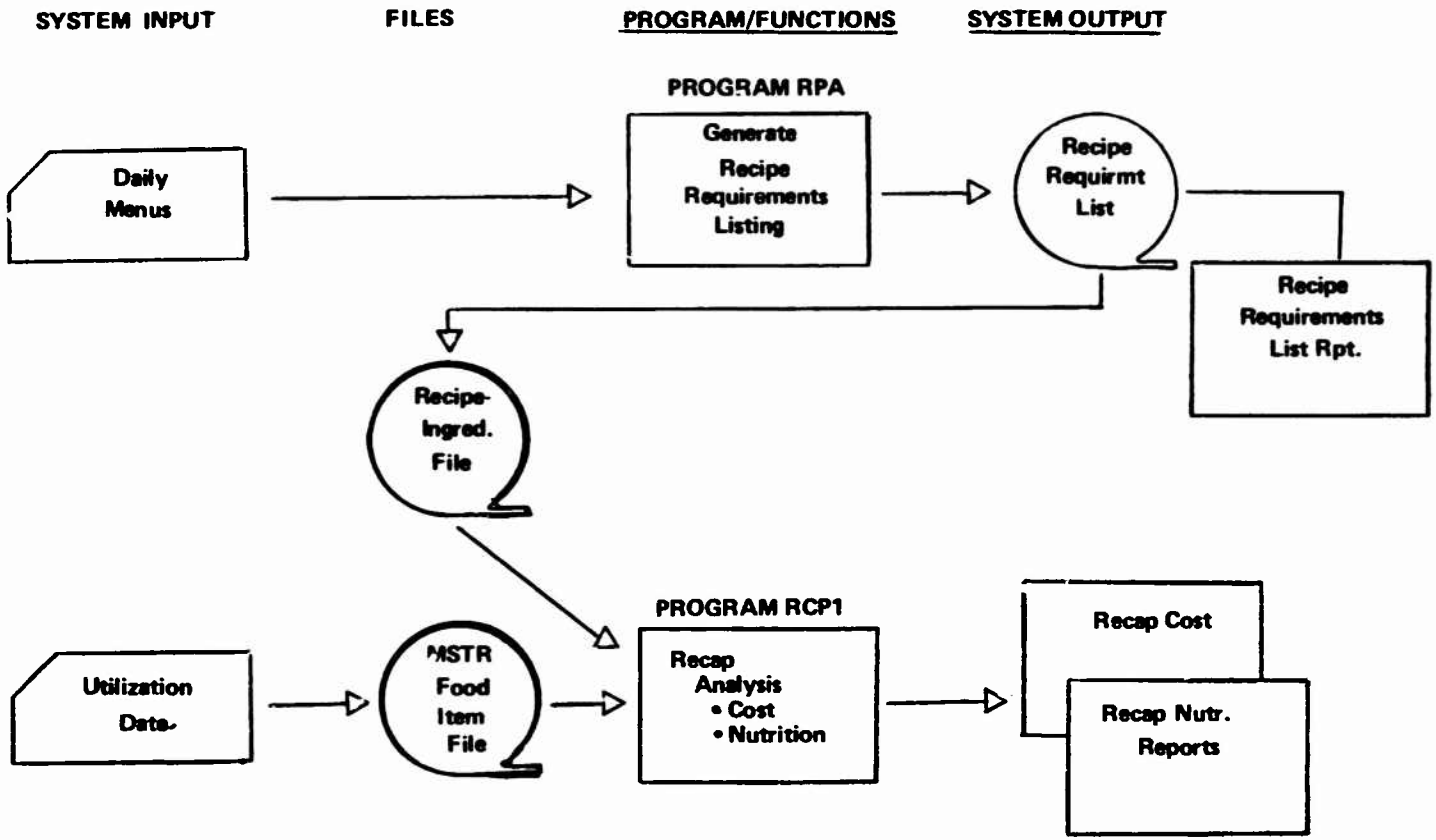

FIGURE 3: FOOD ITEM ANALYSIS DATA FLOW

SYSTEM REPORTS

The primary reports generated with the system are shown under the heading "System Output" in Figures 2 and 3. For each program in the system a brief description of the reports generated and a sample page of the outputs will be presented.

Menu Analysis Program (Figure 2)

This program generates five separate reports for the menu[5] that is entered as input:

1. Daily Cost Report (Figure 4) gives the calculated recipe costs, per portion meal costs and day-total costs per 100 customers for each menu submitted. As shown, actual costs are a function of the issue factor which expresses the percentage of customers who, based on past experiences, will select the particular menu item.

2. Daily Nutrition Report (Figure 5) presents the calculated values of ten nutritive components for each recipe based on 100 customers and the day-total nutritive values per person for each menu submitted. Any nutritional deficiencies for the day based on The Surgeon General's Daily Dietary Allowance[6] are printed out.

3. Daily Preference Report (Figure 6) gives the recipe, preference rating, the arithmetic average preference rating for each meal, and the average of the three meal preference ratings, all based on the 9-point Hedonic Scale for each menu submitted.

4. Summary Cost Report (Figure 7) shows the day-total cost for all days submitted.

5. Summary Nutrition Report (Figure 8) presents the day-total nutritional values for all days submitted.

Menu Category Analysis Program (Figure 2)

This program generates the Menu Category Analysis Report (Figure 9) which presents all the recipes in the system sorted by menu category and ranked from high to low cost per 100 portions. The hedonic and frequency preference ratings for all recipes are also printed.

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5. Table 6 presents the menu card format and Appendix B describes a sample run stream.

6. Army Regulation 40-25, Navy BUMED Instruction 10110.3.D, Air Force Regulation 160-97, dated 10 August 1972.

NATICK LABS COST REPORT
UNIFORM RATION COST SYSTEM

RECIPE NO	RECIPE NAME	MENU CATEGORY	MENU CLASS	STANDARD PORTION SIZE	STANDARD COST/PER PORTION	ACTUAL PORTION SIZE	ACTUAL COST/PER PORTION	ISSUE FACTOR
1005001	FRESH BANANAS	FRUITS	34	4.00 OZ	.0390	2.00 OZ	.0190	50
1019001	CHILLED ORANGE JUICE	FRUIT/VEGTABLE JUICE	61	4.00 OZ	.0340	2.00 OZ	.0170	50
2000101	A LA CARTE MENU	A LA CARTE BREAKFAST	55	6.00 OZ	.3140	6.00 OZ	.3140	100
L002001	BAKED BACON SLICES	BREAKFAST MEATS	51	1.00 OZ	.0850	.50 OZ	.0420	50
L088001	GRILLED SAUSAGE LINKS	BREAKFAST MEATS	51	3.00 OZ	.1180	1.50 OZ	.0590	50
6000101	HOT OATMEAL	BREAKFAST CEREALS	52	5.00 OZ	.0540	5.00 OZ	.0540	100
		SERVING COST PER INDIVIDUAL					.47	
		TOTAL COST THIS MEAL					47.00	
P024201	PEA SOUP	SOUPS	43	8.00 OZ	.0690	8.00 OZ	.0690	100
6010001	CRACKERS	COOKIES	71	2.00 OZ	.0000	2.00 OZ	.0000	100
L080001	PORK CHOP SUEY	CASSEROLES,STEWS,ETC	14	.00 OZ	.2710	.00 OZ	.1350	50
L132001	TURKEY POT PIE	CASSEROLES,STEWS,ETC	14	8.00 OZ	.3180	4.00 OZ	.1590	50
Q054401	OOBRIEN POTATOES	POTATOES	21	5.00 OZ	.0640	2.50 OZ	.0320	50
E005101	STEAMED RICE	RICE	23	8.00 OZ	.0430	4.00 OZ	.0210	50
7010501	BUTTERED CARROTS	OTHER VEGTABLES	33	4.00 OZ	.0260	1.60 OZ	.0100	40
7001001	BUTTERED WAX BEANS	YELLOW VEGTABLES	32	4.00 OZ	.0500	1.60 OZ	.0200	40
M032001	LETTUCE SALAD	VEGTABLE SALADS	42	2.00 OZ	.0120	1.00 OZ	.0060	50
M070001	THOUSAND ISLAND DRESSING	SALAD DRESSING	94	2.00 OZ	.0170	1.00 OZ	.0080	50
M027101	JELLIED PEAR SALAD	FRUIT SALADS	41	3.00 OZ	.0470	1.50 OZ	.0230	50
5020501	SALAD DRESSING	SALAD DRESSING	94	2.00 OZ	.0180	1.00 OZ	.0090	50
6005001	CHOW MEIN NOODLES	CONDIMENTS	92	2.00 OZ	.0270	1.00 OZ	.0130	50
G029301	PINEAPPLE UPSIDE DOWN CAK	CAKES	73	4.00 OZ	.0930	2.00 OZ	.0460	50
H002301	BROWNIES	OTHER DESSERTS	76	4.00 OZ	.0680	2.00 OZ	.0340	50
6020001	ASSORTED BREADS	BREAD AND ROLLS	83	2.00 OZ	.0300	2.00 OZ	.0300	100
6040001	BUTTER	CONDIMENTS	92	1.00 OZ	.0150	1.00 OZ	.0150	100
C005001	COFFEE	HOT BEVERAGES	62	4.00 OZ	.0290	4.00 OZ	.0290	100
6080001	MILK	MILK PRODUCTS	64	8.00 OZ	.1450	8.00 OZ	.1450	100
6085001	TEA	HOT BEVERAGES	62	4.00 OZ	.0110	4.00 OZ	.0110	100
		SERVING COST PER INDIVIDUAL					.73	
		TOTAL COST THIS MEAL					73.00	
L005001	ROAST BEEF	MEAT DISHES	11	5.00 OZ	.4840	2.50 OZ	.2420	50
L069001	BAKED HAM	MEAT DISHES	11	4.00 OZ	.3570	2.00 OZ	.1780	50
0017001	CREAM GRAVY	SAUCES AND GRAVIES	95	1.00 OZ	.0170	.50 OZ	.0080	50
Q077101	PAPRIKA BUTTERED POTATOES	POTATOES	21	5.00 OZ	.0660	5.00 OZ	.0660	100
Q017001	LYONNAISE CARROTS	OTHER VEGTABLES	33	4.00 OZ	.0400	2.00 OZ	.0200	50
Q018001	CAULIFLOWER AU GRATIN	OTHER VEGTABLES	33	4.00 OZ	.1160	2.00 OZ	.0580	50
7004001	SIMMERED BLACKEYE PEAS	GREEN VEGTABLES	31	4.00 OZ	.0490	1.60 OZ	.0190	40
7025501	BUTTERED MIXED VEGETABLES	OTHER VEGTABLES	33	4.00 OZ	.0550	1.60 OZ	.0220	40
M048001	TOSSED VEGETABLE SALAD	VEGTABLE SALADS	42	2.00 OZ	.0370	1.00 OZ	.0180	50
5020001	FRENCH DRESSING	SALAD DRESSING	94	2.00 OZ	.0330	1.00 OZ	.0160	50
M018001	GARDEN COTTAGE CHEESE SLD	VEGTABLE SALADS	42	4.00 OZ	.0580	2.00 OZ	.0290	50
6061001	SHERBET	ICE CREAM	75	4.00 OZ	.0440	2.00 OZ	.0220	50
H026001	REFRIGERATOR COOKIES	COOKIES	71	4.00 OZ	.0250	2.00 OZ	.0120	50
D033501	PAN ROLLS	BREAD AND ROLLS	83	2.00 OZ	.0150	2.00 OZ	.0150	100
6040001	BUTTER	CONDIMENTS	92	1.00 OZ	.0150	1.00 OZ	.0150	100
C005001	COFFEE	HOT BEVERAGES	62	4.00 OZ	.0290	4.00 OZ	.0290	100
6080001	MILK	MILK PRODUCTS	64	8.00 OZ	.1450	8.00 OZ	.1450	100
		SERVING COST PER INDIVIDUAL					.82	
		TOTAL COST THIS MEAL					82.00	

TOTAL COST FOR MEAL DAY 03 202.00

Figure 4. Daily Cost Report - URCS

NATICK LABS NUTRITION REPORT
UNIFORM RATION COST SYSTEM

RECIPE NO	RECIPE NAME	ISSUE FACTOR	NUTRITION									
			FOOD ENERGY (KCAL)	PROTEIN (GM)	FAT (GM)	CALCIUM (MG)	IRON (MG)	VTMN A (IU)	THIAMINE (B1 MG)	RIBO FLAVIN (B2 MG)	NIACIN (MG)	ASCORBIC ACID (C MG)
1005001	FRESH BANANAS	50	4716	61.2	10.8	450	39.60	10620	1.8	1.8	39.6	558.0
1019001	CHILLED ORANGE JUICE	50	3579	51.9	4.5	749	9.00	16074	6.5	1.0	26.0	3579.3
2000101	A LA CARTE MENU	100	76528	3309.2	3967.5	67278	383.60	210094	36.3	113.3	215.1	548.5
L002001	BAKED BACON SLICES	50	5322	264.6	453.0	120	28.80	0	4.2	2.4	45.0	.0
L088001	GRILLED SAUSAGE LINKS	50	8510	535.0	689.0	280	81.00	0	16.0	7.0	79.0	.0
6000101	HOT OATMEAL	100	18040	402.5	210.0	1500	129.60	0	16.9	3.8	28.1	.0
P024201	PEA SOUP	100	13024	805.6	170.4	1848	170.40	3680	29.6	12.0	117.6	40.0
6010001	CRACKERS	100		.0	.0	0	.00	0	.0	.0	.0	.0
L080001	PORK CHOP SUEY	50	20483	1171.5	1406.3	2589	191.30	5347	26.3	12.7	236.6	251.1
L132001	TURKEY POT PIE	50	36205	1782.9	1778.0	2515	224.60	143072	17.3	20.7	460.4	386.3
Q054401	OGBRIEN POTATOES	50	9237	105.5	459.9	4501	18.80	5592	.9	1.0	76.5	783.1
E005101	STEAMED RICE	50	8871	168.0	63.8	1360	65.00	0	10.0	.5	80.0	.0
7010501	BUTTERED CARROTS	40	2797	40.4	153.5	1361	25.00	398832	1.9	1.9	21.1	278.4
7061001	BUTTERED WAX BEANS	40	2584	46.9	202.8	1604	54.50	10[illegible]7	1.0	1.0	14.2	232.3
M032001	LETTUCE SALAD	50	264	18.0	1.8	402	10.20	6660	1.2	1.2	5.4	126.0
M070001	THOUSAND ISLAND DRESSING	50	4351	40.8	411.8	263	23.90	5048	.3	1.0	.4	59.5
M027101	JELLIED PEAR SALAD	50	4913	77.4	6.7	320	10.20	2775	.5	.5	6.3	92.3
5020501	SALAD DRESSING	50	5919	13.5	575.7	192	27.00	3000	.0	.3	.3	.0
6005001	CHOW MEIN NOODLES	50	4990	134.8	239.9	0	.00	0	.0	.0	.0	.0
G029301	PINEAPPLE UPSIDE DOWN CAK	50	24322	189.5	835.4	7319	48.30	12665	3.1	3.4	15.4	216.4
M002301	BROWNIES	50	17435	245.4	984.1	1172	73.60	6876	4.7	5.0	32.4	6.8
6020001	ASSORTED BREADS	100	14454	483.9	163.6	4599	130.70	0	12.9	9.8	127.3	.0
6040001	BUTTER	100	6496	5.4	734.0	182	.00	30000	.0	.0	.0	.0
C005001	COFFEE	100	3730	5.4	43.2	23	1.80	0	.0	.7	.2	.0
6080001	MILK	100	31713	1709.3	1709.3	57513	21.50	69875	10.8	75.3	32.3	537.5
6085001	TEA	100	180	10.8	2.6	548	6.20	260	.4	.2	1.8	692.0
L005001	ROAST BEEF	50	16280	1794.0	960.0	800	23.00	1800	4.0	12.0	326.0	.0
L069001	BAKED HAM	50	17441	1302.2	857.9	1882	222.40	0	37.0	13.5	276.6	.0
0017001	CREAM GRAVY	50	3200	254.1	7.8	8199	44.50	192	3.2	11.9	14.7	44.0
Q077101	PAPRIKA BUTTERED POTATOES	100	15803	349.2	385.0	1261	99.00	15000	13.5	4.5	243.0	3285.0
Q017001	LYONNAISE CARROTS	50	7186	62.6	193.5	2231	47.60	517920	2.7	3.0	29.7	764.3
Q018001	CAULIFLOWER AU GRATIN	50	11451	500.3	486.6	10955	100.80	18910	6.7	15.2	69.1	2740.9
7004001	SIMMERED BLACKEYE PEAS	40	2864	249.4	12.6	738	61.20	2431	3.6	1.8	20.7	.0
7025501	BUTTERED MIXED VEGETABLES	40	2925	82.4	152.6	734	32.00	125232	3.2	1.9	30.1	288.0
M048001	TOSSED VEGETABLE SALAD	50	695	38.2	5.0	1075	17.40	15710	1.3	1.4	15.0	625.3
5020001	FRENCH DRESSING	50	7775	109.1	736.6	290	81.80	0	.0	.0	.0	.0
M018001	GARDEN COTTAGE CHEESE SLD	50	3356	334.3	146.5	2809	26.20	9795	1.4	6.6	10.4	531.0
6061001	SHERBET	50	6809	45.9	60.5	817	.00	3024	.0	1.1	.0	100.8
M026001	REFRIGERATOR COOKIES	50	12598	154.4	634.7	558	48.20	1885	5.2	3.6	40.7	.0
D033501	PAN ROLLS	100	6496	5.4	734.0	182	.00	30000	.0	.0	.0	.0
6040001	BUTTER	100	6496	5.4	734.0	182	.00	30000	.0	.0	.0	.0
C005001	COFFEE	100	3730	5.4	43.2	23	1.80	0	.0	.7	.2	.0
6080001	M_ X	100	31713	1709.3	1709.3	57513	21.50	69875	10.8	75.3	32.3	537.5
TOTALS FOR DAY 03			4855	186.8	231.4	2489	26.02	17829	3.00	4.30	27.7	173.0

Figure 5. Daily Nutrition Report - URCS

NATICK LABS- PREFERENCE ANALYSIS
UNIFORM RATION COST SYSTEM

DAY-MEAL CODE	RECIPE NO	RECIPE NAME	PREFERENCE RATING
031	100500	FRESH BANANAS	6.71
031	101900	CHILLED ORANGE JUICE	7.42
031	200010	A LA CARTE MENU	7.51
031	L00200	BAKED BACON SLICES	7.21
031	L08800	GRILLED SAUSAGE LINKS	6.77
031	600010	HOT OATMEAL	5.52
		OVERALL PREFERENCE RATING	41.14
		AVERAGE PREFERENCE RATING	6.85
032	P02420	PEA SOUP	4.05
032	601000	CRACKERS	5.00
032	L08000	PORK CHOP SUEY	5.69
032	L13200	TURKEY POT PIE	6.19
032	G05440	OBBRIEN POTATOES	6.78
032	E00510	STEAMED RICE	5.71
032	701050	BUTTERED CARROTS	5.53
032	700100	BUTTERED WAX BEANS	5.31
032	M03200	LETTUCE SALAD	6.53
032	M07000	THOUSAND ISLAND DRESSING	6.42
032	M02710	JELLIED PEAR SALAD	5.57
032	502050	SALAD DRESSING	6.12
032	600500	CHOW MEIN NOODLES	5.00
032	G02930	PINEAPPLE UPSIDE DOWN CAK	6.41
032	H00230	BROWNIES	6.65
032	602000	ASSORTED BREADS	5.52
032	604000	BUTTER	5.00
032	C00500	COFFEE	6.36
032	608000	MILK	7.85
032	608500	TEA	6.41
		OVERALL PREFERENCE RATING	118.10
		AVERAGE P FERENCE RATING	5.90
033	L00500	ROAST BEEF	7.31
033	L06900	BAKED HAM	6.80
033	001700	CREAM GRAVY	5.00
033	G07710	PAPRIKA BUTTERED POTATOES	7.00
033	G01700	LYONNAISE CARROTS	5.37
033	G01800	CAULIFLOWER AU GRATIN	4.08
033	700400	SIMMERED BLACKEYE PEAS	4.66
033	702550	BUTTERED MIXED VEGETABLES	5.96
033	M04800	TOSSED VEGETABLE SALAD	6.22
033	502000	FRENCH DRESSING	6.27
033	M01800	GARDEN COTTAGE CHEESE SLD	5.07
033	606100	SHERBET	6.29
033	H02600	REFRIGERATOR COOKIES	5.14
033	D03350	PAN ROLLS	7.46
033	604000	BUTTER	5.00
033	C00500	COFFEE	6.36
033	608000	MILK	7.85
		OVERALL PREFERENCE RATING	101.84
		AVERAGE PREFERENCE RATING	5.99
		DAILY AVERAGE RATING	6.24

Figure 6. Daily Preference Report - URCS

XQT NLMENU DATE 010375 PAGE 18

NATICK LAPS - COST SUMMARY

MEAL DAY	BREAKFAST	LUNCH	SUPPER	TOTAL
001	.61	.74	.73	2.07
002	.55	.82	.67	2.04
003	.57	.73	.75	2.05
004	.70	.72	.80	2.22
005	.42	1.03	.89	2.34
006	.52	.81	.77	2.10
007	.56	.55	1.12	2.23
008	.47	.53	1.01	2.11
009	.63	.83	.59	2.05
010	.60	.54	.90	2.04
011	.43	.75	.80	1.98
012	.39	1.04	.69	2.12
013	.52	.66	.66	1.84
014	.46	1.12	.59	2.17
AVE	.53	.78	.78	2.10
PCT	25.24	37.14	37.14	100.00

Figure 7. Cost Summary Report

NATICK LABS - NUTRITION SUMMARY

MENU DAY	FOOD ENERGY (KCAL)	PROTEIN (GM)	FAT (GM)	CALCIUM (MG)	IRON (MG)	VITMN A (IU)	THIAMINE (B1 MG)	RIBO FLAVIN (B2 MG)	NIACIN (MG)	ASCORBIC ACID (C MG)
1	5393	182.9	257.1	1734	39.63	19639	2.90	3.30	48.0	280.5
2	5004	171.5	197.5	778	32.78	13725	2.70	3.00	35.1	116.0
3	5837	159.7	121.2	1482	37.30	13377	3.70	2.80	39.3	349.6
4	5482	175.4	220.8	1335	37.52	9048	3.10	3.40	48.5	214.2
5	5531	150.3	240.3	1412	30.20	19312	2.80	2.60	34.2	288.9
6	5800	147.7	241.4	1428	34.95	14000	3.70	2.60	32.8	179.9
7	4779	144.1	184.1	1205	29.40	7015	2.40	2.50	38.2	332.3
8	5546	169.0	214.7	1542	33.81	9949	2.70	3.10	38.9	175.7
9	5339	167.1	197.5	1175	32.38	9081	2.80	3.20	34.2	269.7
10	5123	142.9	226.1	855	31.51	8216	3.10	2.40	39.1	189.2
11	5314	157.0	221.8	1102	29.35	5013	2.70	2.50	38.8	214.5
12	5089	150.0	194.5	1254	29.41	6341	2.60	2.50	33.3	252.2
13	5376	142.0	175.6	1305	33.29	21784	3.90	2.70	34.7	306.8
14	5204	160.9	194.3	1608	37.30	9235	3.00	3.30	38.7	342.1
DDA	3830	100.0	135.0	800	14.00	5000	1.70	2.00	22.0	60.0
AVE	5343	158.5	211.7	1276	32.61	11703	3.00	2.90	38.1	250.8
PCT	157.15	211.70	118.54	159.50	235.73	234.06	176.47	145.00	173.18	418.00

Figure 8. Nutrition Summary Report

NATICK LABS- MENU CATEGORY ANALYSIS
UNIFORM RATION COST SYSTEM

MENU CATEGORY NUMBER	CATEGORY DESCRIPTION	RECIPE NO.	RECIPE NAME	COST/100 PORTIONS	PREFERENCE RATING	FREQ-RATING
1	GREEN VEGTABLES	0007401	LYONNAISE GREEN BEANS	5.331	5.79	7.89
1	GREEN VEGTABLES	7022001	BUTTERED BROCCOLI	5.250	5.39	7.56
1	GREEN VEGTABLES	7004001	SIMMERED BL CKEYE PEAS	4.952	4.66	4.65
1	GREEN VEGTABLES	7028001	BTRD SPINACH W/HD CKD EGG	4.893	4.61	4.62
1	GREEN VEGTABLES	7027501	BUTTERED SPINACH W/BACON	4.585	4.61	4.62
1	GREEN VEGTABLES	7024501	BUTTERED GREENS	4.450	3.89	2.30
1	GREEN VEGTABLES	7020501	BUTTERED GREEN BEANS	4.450	5.80	9.63
1	GREEN VEGTABLES	7027001	BTRD SPINACH W/LEM WEDGES	4.425	4.61	4.62
2	YELLOW VEGTABLES	0070201	SCALLOPED SWT POT + APPLE	13.721	5.55	7.53
2	YELLOW VEGTABLES	0067001	CANDIED SWEET POTATOES	11.435	5.63	7.98
2	YELLOW VEGTABLES	0068001	GLAZED SWEET POTATOES	10.163	5.63	7.98
2	YELLOW VEGTABLES	0062001	CREOLE SUMMER SQUASH	9.115	4.46	5.46
2	YELLOW VEGTABLES	7011501	CORN ON COB	7.920	7.41	13.04
2	YELLOW VEGTABLES	0027001	SAUTEED CORN	7.511	6.54	11.10
2	YELLOW VEGTABLES	0063001	FRIED SUMMER SQUASH	7.479	4.31	4.97
2	YELLOW VEGTABLES	0027101	CORN OBRIEN	7.466	6.54	11.10
2	YELLOW VEGTABLES	0024001	SOUTHERN STYLE CORN	6.999	6.54	11.10
2	YELLOW VEGTABLES	7012001	BUTTERED PARSNIPS	6.962	3.85	4.10
2	YELLOW VEGTABLES	0027201	MEXICAN CORN	6.636	7.10	12.86
2	YELLOW VEGTABLES	7024001	BUTTERED WHOLE GRAIN CORN	6.370	7.10	12.86
2	YELLOW VEGTABLES	0064101	LOUISIANA STYLE SMD SQUAS	5.547	4.31	4.97
2	YELLOW VEGTABLES	7002001	BUTTERED WHOLE GRAIN CORN	5.302	7.10	12.86
2	YELLOW VEGTABLES	7001001	BUTTERED WAX BEANS	5.056	5.31	7.30
2	YELLOW VEGTABLES	0022001	CORN PUDDING	4.832	6.54	11.10
2	YELLOW VEGTABLES	7002501	BUTTERED CREAM STYLE COR	4.798	6.54	11.10
2	YELLOW VEGTABLES	0061001	BAKED HUBBARD SQUASH	4.660	4.46	5.46
2	YELLOW VEGTABLES	7014001	BUTTERED RUTABAGAS	4.537	3.93	4.35
2	YELLOW VEGTABLES	0007501	LYONNAISE WAX BEANS	4.518	5.33	7.16
2	YELLOW VEGTABLES	00 9001	MARSHMALLOW SWEET POTATOE	4.249	5.63	7.98
2	YELLOW VEGTABLES	7029001	SUMMER SQUASH	4.130	4.46	5.46
2	YELLOW VEGTABLES	0023001	SCALLOPED CORN	3.837	5.73	7.32
2	YELLOW VEGTABLES	0021001	CORN FRITTERS	3.284	5.73	7.32
3	OTHER VEGTABLES	0035001	FRENCH FRIED ONION RINGS	18.935	6.63	11.01
3	OTHER VEGTABLES	7028501	BUTTERED SUCCOTASH	14.660	5.10	6.42
3	OTHER VEGTABLES	0012001	CAULIFLOWER AU GRATIN	11.626	4.08	4.91
3	OTHER VEGTABLES	0020001	FRENCH FRIED CAULIFLOWER	9.059	4.08	4.91
3	OTHER VEGTABLES	0038001	FRIED PARSNIPS	8.986	3.94	4.64
3	OTHER VEGTABLES	7003001	BUTTERED ONIONS	7.902	5.00	.00
3	OTHER VEGTABLES	0019001	CAULIFLOWER POLONAISE	7.778	4.08	4.91
3	OTHER VEGTABLES	0028001	FRENCH FRIED EGGPLANT	7.497	4.84	6.28
3	OTHER VEGTABLES	0039001	GLAZED PARSNIPS	6.512	3.94	4.64
3	OTHER VEGTABLES	0034101	SPANISH ONIONS	6.073	6.63	11.01
3	OTHER VEGTABLES	7026501	BUTTERED PEAS AND CARROTS	6.050	5.53	7.99
3	OTHER VEGTABLES	0072001	SCALLOPED TOMATOES	5.836	4.95	6.29

Figure 9. Menu Category Analysis Report - URCS

Recipe Requirement Program (Figure 3)

This program produces the Recipe Requirements List report (Figure 10) from the input menu submitted. The cumulative issue factor is the sum of the issue factors called for by the input menu, and the frequency is the number of times a particular recipe appears in the menu.

Menu Recap Program (Figure 5)

Two reports are generated for the input menu:

1. RECAP Cost Analysis Report (Figure 11) presents the total costs and average daily cost per 100 portions for each ingredient (food item) generated from the recapitulation of the menu submitted with the issue factors called for.

2. RECAP Nutrition Analysis Report (Figure 12) presents the nutritional values per 100 portions of the ingredient list generated from the recapitulation of the menu submitted.

Per person values for both cost and nutrition are presented at the end of these two reports.

Other System Products

Food Utilization Reports - The analysis of food utilization data shown in Figure 3 has been fully documented in a separate report, "Patterns of Food Utilization in the Department of Defense," U.S. Army Natick Laboratories Technical Report, TR-65-OR/SA.

Food Preference Reports - Several other sub-tasks within the URCS program involved analyses using food preference data. Of these, two that utilized the URCS computer system were: (1) the correlation of recipe costs to hedonic and frequency preference values, and (2) a system for the preference evaluation of cyclic menus.

NATICK LABS

URCS RECIPE REQUIREMENTS LIST

RECIPE NUMBER	CUMULATIVE ISSUE FACTOR	FREQUENCY
J002001	.500	1
J004C01	.500	1
J004101	.500	1
J005001	.500	1
J007001	1.000	2
J008101	1.000	2
J008201	.500	1
J010001	2.000	4
J016C01	1.000	2
J020301	.500	1
J020401	1.000	2
J020501	.500	1
J027C01	.500	1
J027101	.500	1
J027801	.500	1
J028001	1.500	3
K002101	1.000	2
K003001	1.500	3
K005101	1.500	3
K008001	1.000	2
K009001	1.000	2
K013001	1.500	3
K016101	1.500	3
L002001	17.000	22
L003001	8.500	11
L005001	3.000	6
L007101	3.000	6
L007501	4.000	4
L007601	4.000	4
L008301	.500	1
L009001	.500	1
L009101	1.500	3
L009201	1.000	2
L009301	1.500	3
L012101	.500	1
L013001	.500	1
L015C01	.500	1
L016001	1.500	3
L017C01	.500	1
L018001	.500	1
L022001	1.000	2
L023001	.500	1
L025C01	2.000	4
L028001	2.000	4
L028101	.500	1
L030101	1.500	3
L030201	.500	1
L035001	2.000	4
L035501	.500	1
L037001	1.500	3
L038C01	2.000	4

Figure 10. Recipe Requirements List Report - URCS

NATICK LABS

URCS - COST ANALYSIS RECAP

INGRED NUMBER	INGREDIENT NAME	TOTAL UNITS CONSUMED	COST PER UNIT	COST PER LB	TOTAL COST	AVERAGE DAILY COST
1848	FLOUR WHEAT HARD	117.377	.090	.090	10.564	.2515
1849	FLOUR WHEAT CAKE	28.500	.080	.080	2.280	.0542
1851	FLOUR WHEAT PASTRY	165.198	.120	.120	19.824	.4720
1854	HOMINY GRITS 24 OZ CC	8.500	.285	.190	2.423	.0576
1857	LASANGA NOODLES	12.000	.400	.400	4.800	.1142
1860	MACARONI	15.500	.340	.340	5.270	.1254
1863	NOODLES	42.000	.550	.550	23.100	.5500
1866	NOODLES CHOW MEIN =10	6.000	.900	.600	5.400	.1285
1870	PASTRY MIX, DANISH	9.000	1.450	.290	13.050	.3107
1872	RICE PARBOILED	88.000	.420	.420	36.960	.8800
1876	SWEET DOUGH MIX = 10 CN	28.000	1.372	.305	38.416	.9146
1878	SPAGHETTI	55.500	.350	.350	19.425	.4625
1905	CHOCOLATE CHIPS 12 OZ	6.500	.427	.570	2.776	.0660
1910	COCONUT SWEETENED =3 CYL	8.210	.665	.560	5.460	.1300
1920	ICING MIX CHOCOLATE =10	1.000	1.480	.370	1.480	.0352
1925	ICING MIX VANILLA =10	2.500	1.452	.363	3.630	.0864
1930	MARSHMALLOWS	1.000	.300	.300	.300	.0071
1945	PECANS SHELLED 1-LB	5.500	1.750	1.750	9.625	.2291
1950	SUGAR BROWN	100.495	.220	.220	22.109	.5264
1955	SUGAR GRANULATED	614.101	.245	.245	150.474	3.5827
1960	SUGAR PWDRD 1-LB	97.680	.240	.240	23.443	.5581
1965	WALNUTS ENGLISH SHELLED	9.500	1.250	1.250	11.875	.2827
2000	SOUP DEHY CHICKEN =2 1/2	28.000	.800	.674	22.400	.5333
2010	SOUP DEHY GRN PEA =3 CYL	8.000	1.730	.865	13.840	.3295
2020	SOUP DEHY ONION =2 1/2	13.500	.560	.560	7.560	.1800
2030	SOUP DEHY TOM-VEG =2 1/2	12.000	.660	.660	7.920	.1885
2100	CREAM SUBSTITUTE DRY	50.400	.609	.920	30.694	.7308
2105	DSRT PWD CHERRY =2 1/2	2.000	.[illegible]	.380	1.100	.0271
2110	DSRT PWD LEMON =2 1/2	11.500	.570	.380	6.555	.1560
2115	DSRT PWD LIME =2 1/2	2.000	.570	.380	1.140	.0271
2120	DSRT PWD ORANGE =2 1/2	5.000	.570	.380	2.850	.0678
2125	DSRT PWD RASPB =2 1/2	6.000	.570	.380	3.420	.0814
2130	DSRT PWD STRAWB =2 1/2	7.250	.570	.380	4.133	.0984
2135	DSRT PWD BTRS =2 1/2	2.000	.430	.287	.860	.0204
2140	DSRT PWD CHOC =2 1/2	7.340	.430	.287	3.156	.0751
2145	DSRT PWD VANILLA =2 1/2	7.250	.430	.287	3.113	.0742
2151	PIE FILLING APPLE	1.000	2.800	.400	2.800	.0666
2152	PIE FILLING, BLUEBERRY	2.000	3.570	.510	7.140	.1700
2153	PIE FILLING PEACH	1.000	2.730	.390	2.730	.0650
2155	POTATO CHIPS 1/2-1 1/2 O	49.995	.060	.960	3.000	.0714
2160	TOPPING DESSERT DEHY	15.000	.550	.550	8.250	.1964
2165	TOPPING ICE CREAM, FUDGE	1.500	2.970	.360	4.455	.1060
2200	COCOA 1 LB	8.250	.810	.810	6.683	.1591
2210	COFFEE ROASTED	252.000	1.120	1.120	282.240	6.7200
2305	ALLSPICE GROUND	3.375	.000	2.130	.000	.0000

Figure 11. RECAP Cost Analysis Report - URCS

NATICK LABS
URCS - NUTRITION ANALYSIS RECAP

INGR	UNITS	INGREDIENT NAME	AVERAGE DAILY NUTRITION PER 100 SERVINGS									
			FOOD EG (CAL)	PROTEIN (GM)	FAT (GM)	CALCIUM (MG)	IRON (MG)	VITAMIN-A (IU)	THIAMINE (MG)	RIB-FLAVIN (MG)	NIACIN (MG)	ASCORBIC ACID (MG)
1809	7.0	CAKE MIX DEVILS FOOD	1535	18.2	44.3	302.0	45.0	0	.0	.3	1.7	.0
1812	3.0	CAKE MIX GINGERBREAD=10	689	8.8	16.9	291.0	22.9	0	.0	.2	.5	.0
1818	6.5	CAKE MIX WHITE =10 CN	1524	14.4	41.8	526.0	7.0	0	.0	.2	1.0	.0
1821	42.0	CAKE MIX YELLOW =10 CN	9935	90.5	292.5	3175.0	45.0	0	.5	1.5	6.5	.0
1824	1700.0	CEREAL PREPARED IND	4210	113.3	16.2	850.0	619.3	0	4.0	4.0	76.9	16.2
1827	14.0	CEREAL ROLLED OATS INST	1843	67.1	35.0	250.0	212.5	0	2.8	.6	4.6	.0
1830	2.7	CEREAL ROLLED OATS 20 O	146	5.3	2.8	20.0	16.8	0	.2	.0	.3	.0
1833	2.0	CEREAL WHEAT FARINA 28	137	4.3	.3	189.0	160.0	0	.1	.1	1.3	.0
1836	2.0	CEREAL WHOLE WH ML 22 O	100	4.0	.6	13.0	11.0	0	.1	.0	1.3	.0
1839	9.0	COOKIE MIX OATMEAL NO 1	2277	39.4	98.8	175.0	122.1	0	1.1	.3	2.5	.0
1843	24.5	CORN BREAD MIX = 10 CN	5145	89.3	152.5	333.0	29.6	3806	3.9	2.3	30.4	.0
1845	38.0	CRACKERS GRAHAM	1576	32.8	38.5	164.0	6.2	0	.1	.8	6.0	.0
1848	117.3	FLOUR WHEAT HARD	4628	149.5	14.0	204.0	363.3	0	5.5	3.4	49.7	.0
1849	28.5	FLOUR WHEAT CAKE	1128	36.3	3.4	50.0	88.2	0	1.3	.8	10.8	.0
1851	165.1	FLOUR WHEAT PASTRY	6514	210.4	19.7	287.0	511.3	0	7.8	4.7	62.9	.0
1854	8.5	HOMINY GRITS 24 OZ CO	498	12.0	1.1	5.0	39.5	0	.6	.4	4.8	.0
1857	12.0	LASANGA NOODLES	478	16.2	1.5	35.0	16.9	2	.1	.1	2.2	.0
1860	15.5	MACARONI	618	20.9	2.0	45.0	21.8	0	.1	.1	2.8	.0
1863	42.0	NOODLES	1760	58.1	20.9	141.0	86.0	1000	.7	.4	9.7	.0
1866	6.0	NOODLES CHOW MEIN =10	475	12.8	22.8	.0	.0	0	.0	.0	.0	.0
1870	9.0	PASTRY MIX, DANISH	2976	41.4	143.5	370.0	3.3	0	.5	1.2	3.8	.0
1872	88.0	RICE PARBOILED	3507	70.4	2.9	570.0	272.4	0	4.1	.2	33.5	.0
1876	28.0	SWEET DOUGH MIX = 10 CN	5796	138.9	193.2	966.0	135.0	1740	.3	1.8	10.8	.0
1878	55.5	SPAGHETTI	2212	74.9	7.1	161.0	38.0	0	.5	.3	10.1	.0
1905	6.5	CHOCOLATE CHIPS 12 OZ	267	2.2	18.8	16.0	13.7	10	.0	.0	.2	.0
1910	8.2	COCONUT SWEETENED =3 CY	538	3.6	38.3	16.0	20.0	0	.0	.0	.3	.0
1920	1.0	ICING MIX CHOCOLATE =10	92	.3	1.1	2.0	1.6	0	.0	.0	.0	.0
1925	2.5	ICING MIX VANILLA =10	105	.1	2.4	2.0	1.9	0	.0	.0	.0	.0
1930	1.0	MARSHMALLOWS	34	.2	.0	2.0	1.7	0	.0	.0	.0	.0
1945	5.5	PECANS SHELLED 1-LB	400	5.5	42.3	43.0	14.3	77	.5	.1	.5	.9
1950	100.4	SUGAR BROWN	4049	.0	.0	924.0	368.5	0	.0	.2	1.9	.0
1955	614.1	SUGAR GRANULATED	25532	.0	.0	.0	76.0	0	.0	.0	.0	.0
1960	97.6	SUGAR PWDRD 1-LB	4061	.0	.0	.0	11.6	0	.0	.0	.0	.0
1965	9.5	WALNUTS ENGLISH SHELLED	668	15.2	65.7	102.0	31.9	32	.3	.1	.9	2.0
2000	28.0	SOUP DEHY CHICKEN =2 1/	1375	49.5	33.7	169.0	89.5	221	1.3	.7	17.3	.0
2010	8.0	SOUP DEHY GRN PEA =3 CY	620	38.4	8.1	88.0	81.1	175	1.4	.6	5.6	1.9
2020	13.5	SOUP DEHY ONION =2 1/2	411	21.2	3.3	188.0	68.3	141	.2	.5	12.7	24.8
2030	12.0	SOUP DEHY TOM-VEG =2 1/	447	15.3	9.2	119.0	40.3	4617	.3	.5	7.4	55.4
2100	50.4	CREAM SUBSTITUTE DRY	2018	16.2	129.5	67.0	25.3	0	.0	2.0	.4	.0
2105	2.0	DSRT PWD CHERRY =2 1/2	170	3.0	.0	.0	.0	0	.0	.0	.0	.0
2110	11.5	DSRT PWD LEMON =2 1/2	689	17.5	.0	.0	.0	0	.0	.0	.0	.0
2115	2.0	DSRT PWD LIME =2 1/2	120	3.0	.0	.0	.0	0	.0	.0	.0	.0

Figure 12. RECAP Nutrition Analysis Report - URCS

SECTION II

SYSTEM DOCUMENTATION

SYSTEM NARRATIVE

The URCS computer system was designed and developed with two separate functional sections, each containing several programs. These sections are file maintenance and updating, and menu and food item analysis. Figures 1, 2, and 3 in Section I provide the conceptional flow of data in the system.

File Maintenance and Updating Section

This section builds and updates the three system files: (1) Detail Recipe Ingredient file (DREC-INGD),[7] (2) Master Food Item file (MSTR-INGR) and, (3) Master Recipe file (MSTR-RECIPE). The programs included within this section are File Maintenance (FMDI) and Update (UPDT).

Program FMDI builds and updates the Detail Recipe Ingredient file on mass storage. The input data is the complete set of recipes from the Armed Forces Recipe Service, coded on cards for entry into the system. The basic card deck was obtained from Dietary Programs Office of U.S. Army Troop Support Agency, Fort Lee, Virginia.

Program UPDT builds and updates the two other major files. Initially it converts food item name, cost, and nutritional data from cards to the Master Food item file on mass storage. MSTR-INGR along with DREC-INGD are then combined to generate the Master Recipe file (MSTR-RECIPE) which contains the cost, nutritional, and preference summary data for each recipe in the system.

Menu and Food Item Analysis Section

Within this section various analyses, file sortings, and report generations are accomplished. There are four programs in this section: Menu Analysis (MENU), Menu Category Analysis (CATA), Recipe Requirements Analysis (RPA), and Menu Recap Analyses (RCPI).

Program MENU accomplishes the recipe level evaluations and analysis. Menus are input in card form, and cost, nutrition, and preference reports are produced for each meal and day. The issue factor for each recipe can take on any value from 0 to 999 by placing the desired number in the input card. The standard recipes are in units of 100 portions. MSTR-RECIPE is the only file accessed by this program.

---

7 A complete list of system codes is found in Appendix A and sample run streams are contained in Appendix B.

Program CATA sorts the entire Master Recipe file on a two digit code, the menu category, rank orders the recipes in each category from high to low cost per portion, and prints out related hedonic and frequency preference data within each category. Lists of high preference recipes are generated by the use of a preference parameter card that contains a cut-off hedonic rating that deletes all the recipes below this value.

The next two programs, RPA and RCPI, provide the ability to analyze input menus at the ingredient level and generate the food item requirements for the respective menu. Program RPA converts the menu to be analyzed into a recipe requirements list. For the menu cycle under analysis a listing of all unique recipes along with the cumulative issue factor and the total frequency called for is generated. This yields a simplified form of the recipe frequency chart used by menu planners. The major function of this program is to edit the recipe information for the menu recap program.

Program RCPI takes the output from Program RPA, the recipe requirements list, and generates cost and nutritional reports for all the food items required by the input recipes. Program RCPI accesses two other files, DREC-INGD and MSTR-INGR, as the recipes are translated into poundage amounts for each required food item.

System Environment

The programming language for all the programs is American National Standard COBOL and was developed on a Univac Model 1106 (with an Exec-8 operating system) at the U.S. Army Natick Laboratories. The operating conditions for the major programs are contained in Table I.

TABLE I

PROGRAM REQUIREMENTS - URCS COMPUTER SYSTEM

PROGRAM	CORE REQUIREMENTS	DISK AREAS	RUN TIME (min:sec)	INPUT MEDIA	OUTPUT
FMDI	36K	5 track	0:34	CARDS	disk-file print-file
UPDT	36K	5 track	2:47	CARDS	disk-file print-file
MENU	36K	5 track	1:15*	CARDS	print rpt
CATA	36K	5 track	0:32	N/A	print rpt
RPA	36K	5 track	0:05*	CARDS	disk-file print rpt
RCPI	36K	5 track	0:56*	N/A	print rpt

*Sample run times for processing 42 days of menu input data.

PROGRAM NARRATIVES

File Maintenance & Updating Programs

The File Maintenance Program (FMDI) and the Update Program (UPDT) develop and update the three system files:

1. Detail Recipe Ingredient File (DREC-INGD)
2. Master Food Item File (MSTR-RECIPE)
3. Master Recipe File (MSTR-INGR)

All of the data elements utilized in these files are input in card form and consist of the following:

1. Armed Forces Recipe Service Master Deck
2. Food Item Nomenclature Master Deck
3. Food Item Price List Deck
4. Nutritional Data Deck

Record layouts for the three files and card layouts for the source decks are found in the next Section, SYSTEM INPUT AND FILE DESCRIPTIONS.

The functions of FMDI and UPDT are: (1) to initially create the desired files on mass storage, and (2) to reflect any changes in the source data in the appropriate files. Figures 13 and 14 are the functional flow diagrams of FMDI and UPDT.

Initial Creation of Files - The first step performed by Program FMDI places the Armed Forces Recipe Service Master deck on mass storage. This file (DREC-INGD) contains all the recipes and the ingredient formulations available in the system.

The next step develops and maintains the Master Food Item file (MSTR-INGR) on mass storage. This file is made up of elements from source decks 2, 3, and 4 above. The first segment of Program UPDT accomplishes this and is shown in the upper portion of Figure 14.

The last step in the file creation merges DREC-INGD with MSTR-INGR to generate elements necessary in the Master Recipe file (MSTR-RECIPE). The procedure presented schematically in the lower section of Figure 14 is the following:

1. The Detail Recipe/Ingredient file (DREC-INGD) is the basis from which the summary data is generated. For each ingredient of each recipe a four digit food item code is used as a key to access the corresponding record in the Master Food Item file (MSTR-INGR).

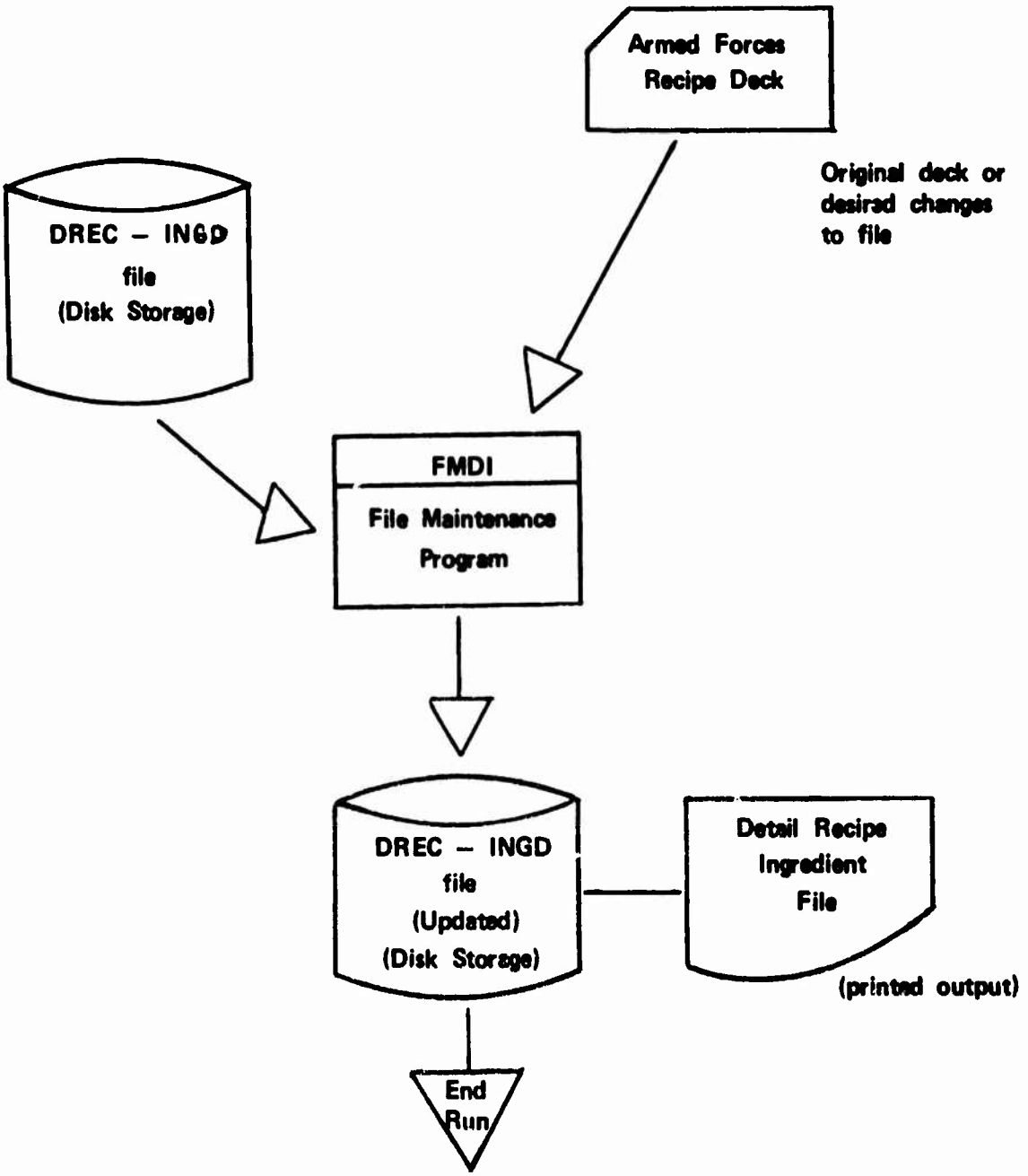


FIGURE 13. FILE MAINTENANCE PROGRAM – FUNCTIONAL FLOW DIAGRAM

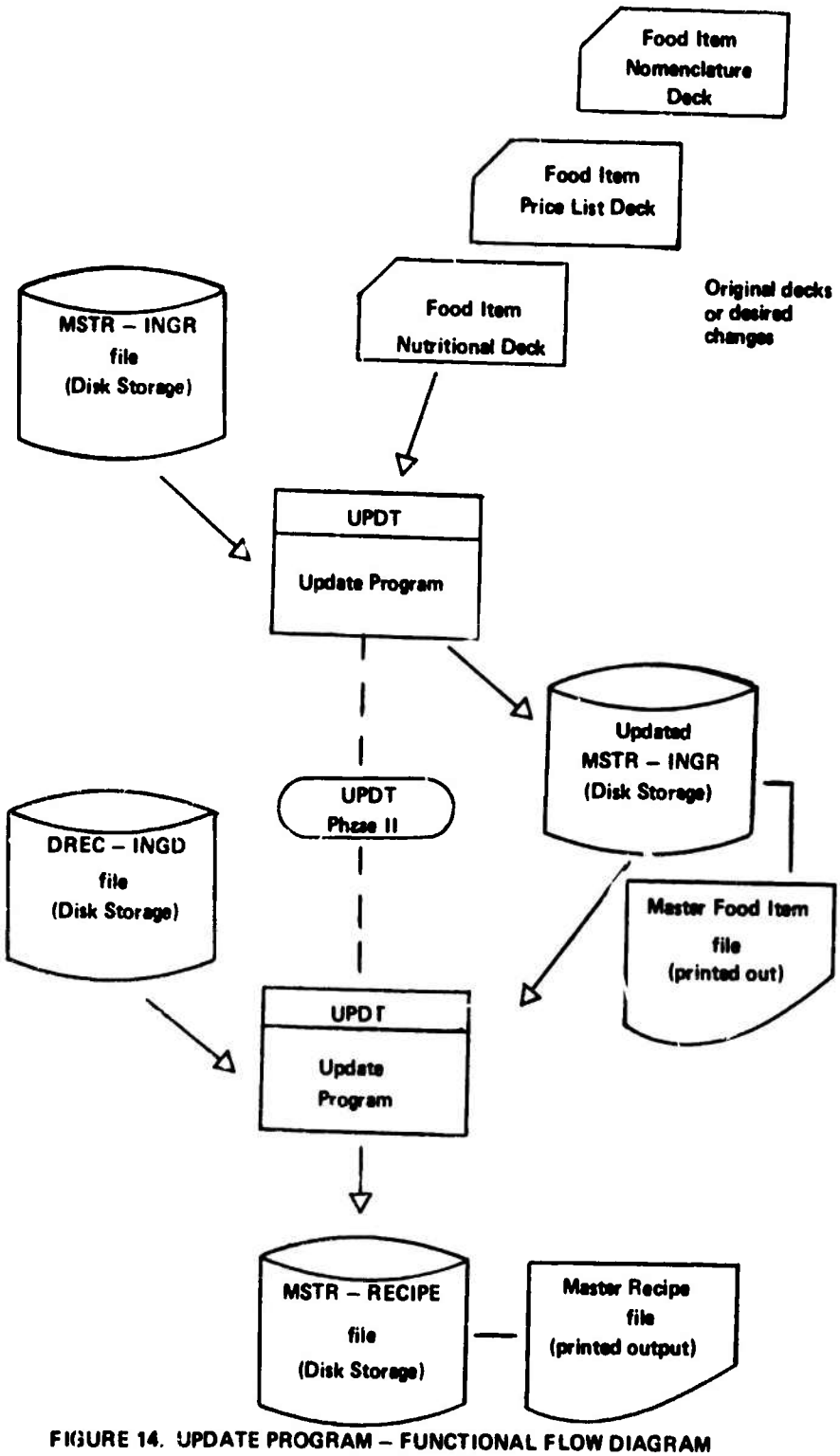


FIGURE 14. UPDATE PROGRAM – FUNCTIONAL FLOW DIAGRAM

2. For each ingredient within a recipe all the data elements from the record in MSTR-INGR are placed in a work area

3 When a complete recipe is read into the work area the data elements containing nutrition and cost information are summed to create recipe cost and recipe nutritional values

4 This summary data at the recipe level, as well as other descriptive information, is extracted to form records in the Master Recipe file (MSTR-RECIPE) maintained on mass storage.

File Updating - The three files DREC-INGD, MSTR-INGR, and MSTR-RECIPE may require updates such as price changes, new recipe formulations, recipe additions or deletions, or new food items. The URCS System has the following three classes of updating procedures.

1 Class I Update-Detail Recipe/Ingredient File Changes. - This occurs when the formulation of a standard recipe is modified or when a new recipe is added to the system of standard recipes. Program FMDI merges the ingredient change or new recipe (in card format with existing Detail Recipe/Ingredient file, either replacing the "old" recipe formulation in the case of making ingredient changes or entering the file in the proper location according to the new recipe number (i.e., L0091 would be placed directly after the last record of recipe L0090) There is no set schedule when these changes could occur; for example, the changes in recipes would be batched together and posted into the file in a timely manner.

2 Class II Update-Master Food Item File Changes. - This update occurs when the price of a food item changes, nutritional values change, or when new food items are added to the system. Program UPDT takes the updated food prices or new food items in card form and updates MSTR-INGR. The date of the latest price change for all food items is retained within the file.

Due to the random access file techniques employed, only the cards being changed or updated are placed in the run stream for both Class I and II updates The entire source deck does not have to be resubmitted into the system every time a change is made.

3. Class III Update-Master Recipe File Update. - When Program UPDT makes changes to the Master Food item file, the entire Master Recipe file is recreated. The option to update MSTR-RECIPE at other times can be accomplished on a selective basis Each time this is completed, the elements found in the Master Recipe file would reflect the current input source data.

Menu Analysis Program

The Menu Analysis Program (MENU) evaluates input menus for cost, nutrition, and preference parameters Figure 15 presents the functional flow diagram of Program MENU.

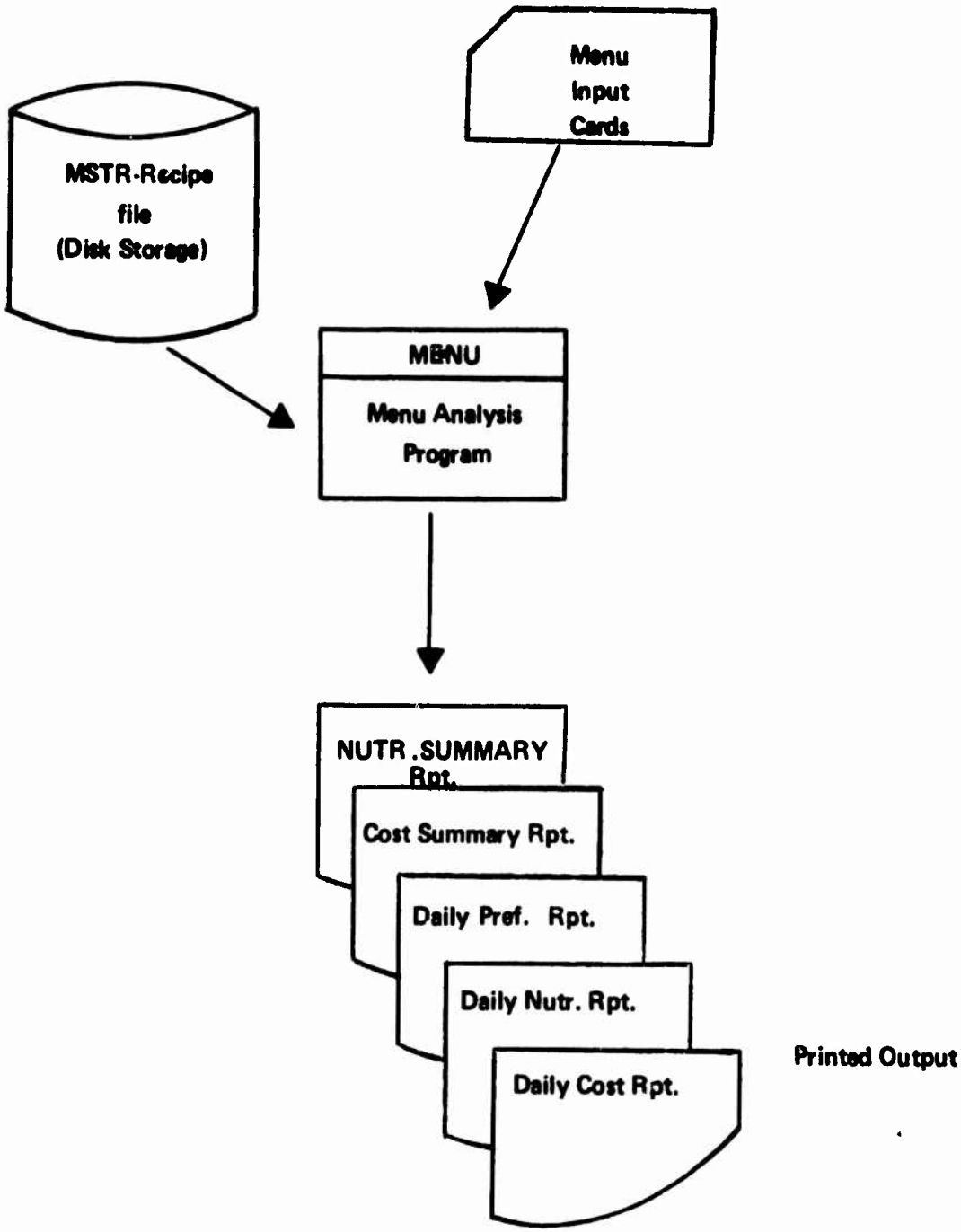


FIGURE 15. MENU ANALYSIS PROGRAM –
FUNCTION AL FLOW DIAGRAM

Input Processing - The card input to Program MENU contains the following formatted data: menu day, meal code, recipe number, issue factor, and portion size desired (see section SYSTEM INPUT AND FILE DESCRIPTIONS for card layouts). The menu day and meal code controls the processing within the program; menu cost and preference processing are performed on a meal basis and all three parameters (cost, nutrition, and preference) are processed for each menu day. As each recipe number is loaded, the MSTR-RECIPE file is searched by a random access technique to find the matching record. Invalid recipe numbers key an error message generated for that menu day. The issue factor can take on a range of values from 0 through 999, although it will normally not exceed 100 for serving 100 men. Program MENU used the issue factor as a scale on the corresponding recipe record in MSTR-RECIPE.

Report Generation - The two levels of reports generated from Program MENU are daily analyses and summary reports. Figures 4 through 8 found in Section I are sample outputs from Program MENU. The first daily report is the Cost Report, containing recipe costs for each recipe, total meal cost for each meal, and daily cost for each menu day submitted. The Daily Nutrition report displays the nutritional values for all the recipes for each menu day. Total daily per person nutritional values are also shown, along with warning messages if the day's menu is deficient in one or more nutrients. The Daily Preference report presents the hedonic ratings for each recipe and the meal and menu day averages for each menu submitted.

Two summary reports are also produced by MENU. The Cost Summary gives the daily food cost for all the menu days submitted and the Nutrition Summary gives the daily nutritional values for all the days.

Menu Category Analysis Program

The Menu Category Analysis Program (CATA) used the entire MSTR-RECIPE file as the input data. The recipes are sorted by a two digit menu category code and recipe portion cost. The processing of the data is depicted in a functional flow diagram in Figure 16.

Sorting & Processing - The Master Recipe file is sorted by menu category major and recipe cost minor. A listing of the menu categories is shown in Table 2. Recipes are sorted by major category (e.g., Category 2 - Starches), then by minor category within each major category (e.g., 21 potatoes) and finally by recipe portion cost (for 100 portions) from high to low. The recipe portion costs in each major category (1 - 9) are summed together and the average cost is computed. Contained in MSTR-RECIPE, for each recipe, are preference ratings (hedonic values) which measure the relative acceptance or dislike for the particular recipe. These hedonic ratings, as well as the frequency preference ratings, are printed on the output report from Program CATA. An optional analysis will generate a subset of high preference recipes within each category. A parameter card inserted in the front of Program CATA will extract only those recipes with a hedonic rating equal to or above the specified value.

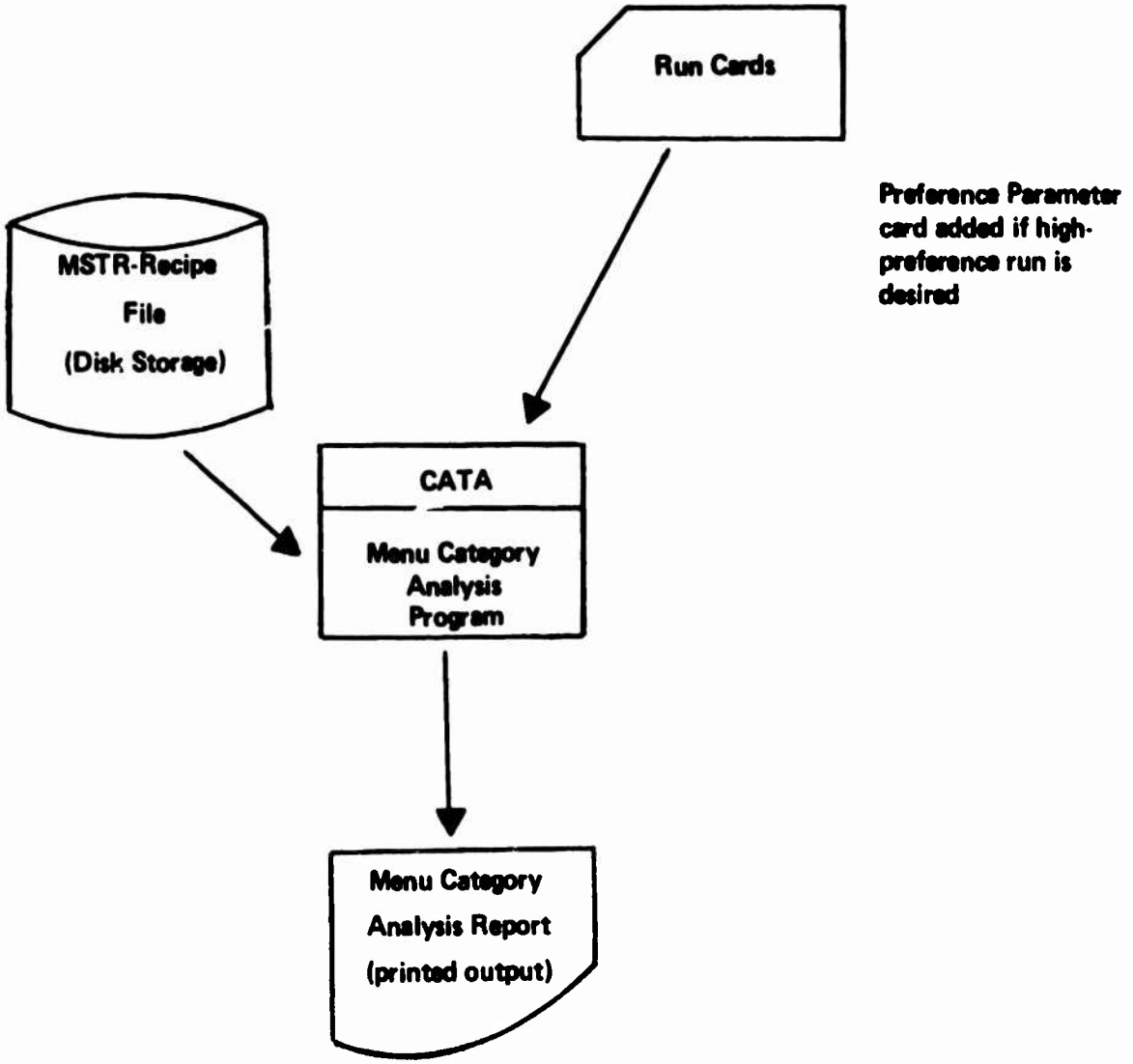


FIGURE 16. MENU CATEGORY ANALYSIS PROGRAM – FUNCTIONAL FLOW DIAGRAM

TABLE 2

MENU CATEGORIES-URCS SYSTEM

CATEGORY 1 -	MEATS, ENTREES
11	Meat Dishes
12	Fish and Seafood
13	Pasta-Main Dish
14	Casseroles, Stews, Etc.
15	Short Order, Sandwiches
CATEGORY 2 -	STARCHES
21	Potatoes
22	Beans
23	Rice
24	Pasta-Side Dish
CATEGORY 3 -	VEGETABLES AND FRUITS
31	Green Vegetables
32	Yellow Vegetables
33	Other Vegetables
34	Fruits
CATEGORY 4 -	SALADS AND SOUPS
41	Fruit Salads
42	Vegetable Salads
43	Soups
CATEGORY 5 -	BREAKFAST DISHES
51	Breakfast Meats
52	Breakfast Cereals
53	Eggs
54	Griddle Cakes, Etc.
55	A La Carte Breakfast
CATEGORY 6 -	BEVERAGES
61	Fruit/Vegetable Juice
62	Hot Beverages
63	Fruit Drinks
64	Milk Products
65	Carbonated Beverages
66	Other Beverages
CATEGORY 7 -	DESSERTS
71	Cookies
72	Puddings
73	Cakes
74	Pies
75	Ice Cream
76	Other Desserts
CATEGORY 8 -	BREAD PRODUCTS
81	Muffins
82	Buns, Doughnuts, Etc.
83	Bread and Rolls
CATEGORY 9 -	MISCELLANEOUS ITEMS
91	Appetizers
92	Condiments
93	Stuffing/Relish
94	Salad Dressing
95	Sauces and Gravies

Report Generation - A sample of the Menu Category Analysis report is given in Figure 9. The designation of discrete menu categories (Table 2) can be expanded or reduced without much difficulty. The listing used in this program was taken as a baseline and can be modified later if desirable.

Recipe Requirements Program

The Recipe Requirements program (RPA) processes the input menu deck into a form that is acceptable to the Menu Recap Program (RCPI). Figure 17 presents a functional flow diagram of the Recipe Requirements and the Menu Recap programs.

Program Processing - The input menu deck consists of a list of recipes for each meal for all the menu meal days submitted, a listing of all the unique recipes would be a logical first step in generating a recapitulation of the input menus. Program RPA performs this first translation. The program generates a sequenced list of all the unique recipes along with the cumulative issue factor and the frequency served over the menu cycle under analysis. The major function of Program RPA is the preprocessing of input recipes for input into Program RCPI. Figure 10 presented in Section I is a sample output from RPA.

Menu Recap Program

The Menu Recap program (RCPI) generates the composite list of all the food items or ingredients required by the menu under analysis and performs a cost and nutritional analysis for evaluation.

Program Processing - Three files are accessed by Program RCPI: Recipe Requirements List workfile, DREC-INGD and MSTR-INGR. The sequence of events is:

1. The workfile (WFI) built by Program RPA is accessed and read into Program RCPI.

2. For each recipe in the ordered list (WFI), the corresponding records from DREC-INGD are accessed and moved into a second workfile (WF2).

3. The ingredient amounts (by unit of issue) for each recipe assessed are extended by the cumulative issue factor for that recipe (which factor was contained in WFI).

4. The file WF2, when built, contains the total raw ingredient requirements for the menu under analysis.

5. File WF2 is then sorted in ascending order on the 4-digit food item code found in each ingredient record. Once sorted, the records with similar codes are combined to form workfile #3 (WF3).

6. The data is now in recap form and contains the following information: food item name, food item code, unit of issue, and the total units required for the entire menu.

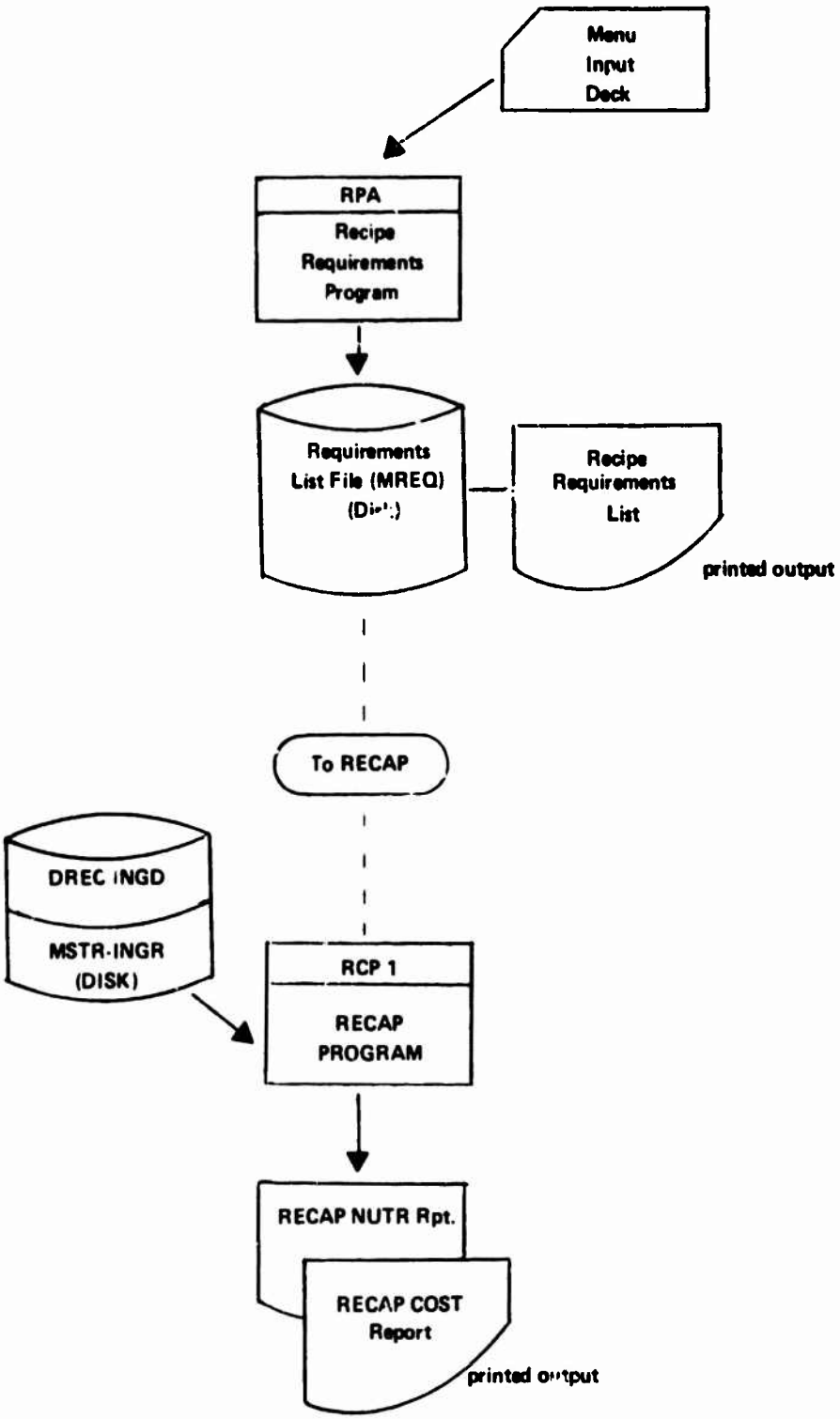


FIGURE 17. RECIPE REQUIREMENT AND RECAP PROGRAMS – FUNCTIONAL FLOW DIAGRAM

7. The workfile (WF3) is matched with the Master Food Item file (MSTR-INGR) to extract cost and nutritional data. When the associated cost and nutritional data are multiplied by the required amounts for each ingredient, both cost and nutritional reports are generated.

Report Generation - The output from this program consists of two reports. The first includes the cost extension of all items in the food item list and the average daily cost for each item in terms of 100 rations per day. The second contains the extension of the total nutritional values for each food item and the daily average per ration nutritional intake. Figures 11 and 12 presented in Section I are sample outputs from RCPI.

Food Class Analyses - All the food items within the Master Food Item file are classified into one of sixteen food classes. Table 3 presents a listing of the 16 classes. The capability exists to sort the output from Program RCPI by food classes. This will allow analysis by the 16 food groups shown in Table 3. Other groupings of food itemscan be employed if desirable. It will be noted that food classes deal with "raw" food items while menu categories (Table 2) provide sorting on individual recipes. Thus, the two categorizations are, in a sense, mutually supporting andprovide considerable analytical detail and flexibility.

TABLE 3

FOOD CLASS LISTING - URCS SYSTEM

01	Meat, fish, and poultry
02	Eggs
03	Milk and milk products
04	Butter, other spreads
05	Other fats, oils, and dressings
06	Sugar, syrups, other sweets
07	Cereals, other grain products
08	Beans, and other legumes
09	Leafy, green, and yellow vegetables
10	Tomatoes and tomato products
11	Citrus fruits
12	Potatoes
13	Other vegetables
14	Fruits other than citrus
15	Beverages
16	Miscellaneous items

SYSTEM INPUT AND FILE DESCRIPTIONS

Input Descriptions

The input medium is cards for all the programs as the system is currently operational in a batch mode only. Preliminary effort placed in developing a conversational capability for the system has exhibited the applicability of the system in a real-time environment as well as in a batch mode.

Card inputs fall into two categories: (1) initial or update data for file creation and maintenance, and (2) input data to be analyzed by the system. The programs FMDI and UPDT deal with category (1) above with the input source data:

1. Armed Forces Recipe Service Master Deck
2. Food Item Nomenclature Master Deck
3. Food Item Price List Deck
4. Food Item Nutrition Deck

Tables 4 and 5 are the card formats of these source data decks. The decks include all the required data pertaining to recipe formulations, food item nutritional data, food item price information, conversion codes for unit of issue quantity to pounds, food and recipe classifications, portion sizes, and food preference data.

In the menu and food item analysis programs there is only one type of card input, the menu input deck. These cards are used by the Menu Analysis program and the Recipe Requirements program; each record contains the recipe number, meal and menu day codes, and the issue factor and portion size designated for analysis. Table 6 presents the card format of the menu input deck.

System File Descriptions

The three system files, Detail Recipe/Ingredient file, Master Food Item file, and Master Recipe file are maintained on disk mass storage during processing. Backup files (father tapes) are maintained in the tape library in the event of system failure. A random access search technique is built into the system allowing for efficient data retrieval. The record layout for the Detail Recipe/Ingredient file is identical to the Armed Forces Recipe Service Master Deck found in Table 4. Record layouts for the Master Food Item file and the Master Recipe file are presented in Table 7.

Input/Output Scheme

The URCS System input-output data flow is summarized in Table 8. The input media is either cards or mass storage file, and the output is either printed reports or mass storage file.

TABLE 4

ARMED FORCES RECIPE MASTER DECK - CARD FORMAT

A. Recipe name card (header)

Element	Card Col.
Recipe No.	1-5
Sequence No. (01)	6-7
Recipe Name	9-33
Portion Size (oz)	34-35
Menu Category	44-45
Food Preference Data	51-57

B. Ingredient cards

Recipe No.	1-5
Sequence No.	6-7
Ingredient Name	9-33
Unit/Issue Fractional Amt	34-41
Food Item No.	43-46
Unit/Issue Decimal Amt	47-50

TABLE 5

FOOD ITEM DATA DECKS - CARD FORMAT

A. Food Item - Nomenclature Master Deck

Element	Card Col.
Food Class	1-2
Food Item (Ingredient) No.	3-6
Ingredient Name	7-31

B. Food Item Price List Deck

Element	Card Col.
Federal Supply Catalog No.	1-13
Food Item No.	16-19
Date of Last Price Change	21-26
Latest Price Per Lb.	28-31

C. Food Item Nutrition Deck

Element	Card Col.
Food Item No.	1-4
Nutritional Value/Lb.	
Food Energy	14-17
Protein	19-22
Fat	24-27
Calcium	29-33
Iron	34-38
Vitamin A	41-46
Thiamine	48-51
Riboflavin	53-56
Niacin	58-61
Ascorbic Acid	63-68
Food Class No.	69-70
Unit of Issue Conversion Factor (converts U/I to Lb.)	72-77

TABLE 6

MENU INPUT DECK - CARD FORMAT

Element	Card Col.
Recipe No.	1-5
Issue Factor	8-11
Menu Day	17-18
Meal Code	19

TABLE 7

MASTER FOOD ITEM FILE & MASTER RECIPE FILE RECORD LAYOUTS

Master Food Item file (MSTR-INGD)

Element	Field Location
Food Item No.	1-4
Food Class	7-8
Federal Stock No.	10-22
Food Item Name	24-51
Date of Latest Price Change	54-59
Conversion Code Unit/Issue to Lbs.	68-73
Food Item Cost per Lbs.	76-80
Nutrition Values	
Food Energy	81-85
Protein	86-90
Fat	91-95
Calcium	97-101
Iron	103-107
Vitamin A	109-114
Thiamine	116-119
Riboflavin	121-124
Niacin	126-129
Ascorbic Acid	131-136

Master Recipe file (MSTR-RECIPE)

Element	Field Location
Recipe No.	1-7
Recipe Name	8-32
Portion Size	33-39
Cost per 100 Portions	40-44
Nutrition Values	
Food Energy	45-49
Protein	50-54
Fat	55-59
Calcium	60-64
Iron	65-69
Vitamin A	70-75
Thiamine	76-79
Riboflavin	80-83
Niacin	84-87
Ascorbic Acid	88-93
Menu Category	94-95
Food Preference Data	100-117

TABLE 8

URCS COMPUTER SYSTEM INPUT/OUTPUT SCHEME

System Input	Armed Forces Recipe Service Card Deck	1) Food Item Name Deck 2) Food Item Price Deck 3) Food Item Nutr. Deck	DREC-INGD MSTR-INGR	Menu Input Card Deck MSTR-RECIPE	MSTR-RECIPE	Menu Input Card Deck	MREQ DREC-INGD MSTR-INGR
Program	FMDI[1]	UPDT	UPDT[2]	MENU	CATA	RPA	RCPI
System Output	Detail Recipe Ingredient file (DREC-INGD)	Master Food Item file (MSTR-INGR)	Master Recipe file (MSTR-RECIPE)	Print Reports: NLABS Cost NLABS Nutr. NLABS Pref. NLABS Cost Summary NLABS Nutr. Summary	Print Report: NLABS Menu Category Analysis	Print Reports: Recipe Requirements List Recipe Requirements file (MREQ)	Print Reports: URCS Cost Recap URCS Nutr. Recap

1. A complete list of system codes is found in Appendix A.

2. The generation of MSTR-RECIPE is performed by Program UPDT after MSTR-INGR file is updated.

RESULTS AND RECOMMENDATIONS

Results

A computer system has been developed that will evaluate any menu for cost, nutrition, and food preference. The system not only has the flexibility to analyze menus but also recapitulations of menus or food item lists (i.e., the quantities of "raw" food items consumed by a given number of people over a specified period of time). Existing recipe and food item standardization has been maintained, and the system thus provides the basis for a common food/menu analysis system within the Department of Defense.

Food requirements for various recipe combinations and feeding levels can be generated by adjusting the issue factors on the input menus. These changing requirements are reflected in menu cost, nutritional values, and total raw food required. Other applications within food service management, such as food cost control and preference evaluation of installation menus, are now possible through the utilization of the system.

This system provides the basic framework for a new food cost system that would allow the military departments to consider basing the Basic Daily Food Allowance (BDFA) on an entire menu rather than a 50 item food cost index. The procedure would be to develop the best menu based on preference and/or cost considerations and make it the reference menu for the DoD. Under this concept, the recap of this reference menu would become the new food cost index. The computation of the monetary value of the BDFA would be performed by the system by applying the latest food price list to all the food items called for in the reference menu.

Recommendations

1. It is recommended that the development of new and diverse applications of the system to Department of Defense food research programs be investigated. The desirability of expanding the system to include other food attributes and weight and volume measures should be considered.

2. Further study of the total menu--food cost index concept is recommended. The evaluation of numerous high preference menu alternatives can now be accomplished expeditiously.

3. The application of the system within an operating environment should be a continuing effort as the needs are developed within the military departments. The functions of food production control, menu planning and adjustment, and food item and recipe costing are now simplified with the use of the computer software.

4. The initial step in the automation of DoD food item and recipe information has been accomplished. The uniform approach to food service analyses can be enhanced by the expansion of the system. Coordination among the Department of Defense agencies in the application of a standard system of codes and procedures would support the policy of uniformity currently being carried forward under the Department of Defense Food Planning Board.

Appendix A - System Codes

System Programs

CATA - Menu Category Analysis Program

FMDI - File Maintenance Detail Recipe/Ingredient Program

MENU - Menu Analysis Program

RCPI - Recap Analysis Program

RPA - Recipe Requirements Program

UPDT - Update Program

System Files

DREC-INGD - Detail Recipe Ingredient File

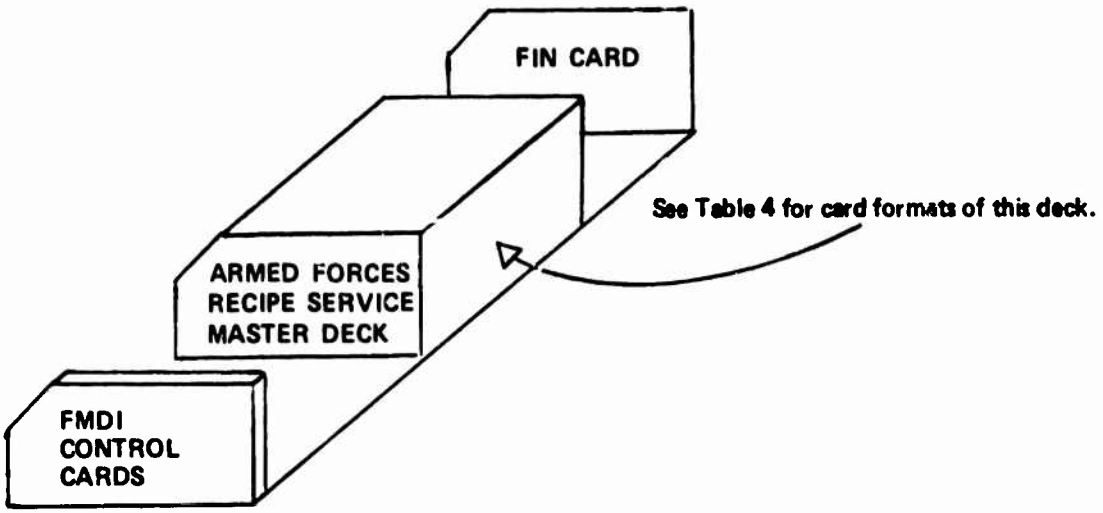
MSTR-INGR - Master Food Item File

MSTR-RECIPE - Master Recipe File

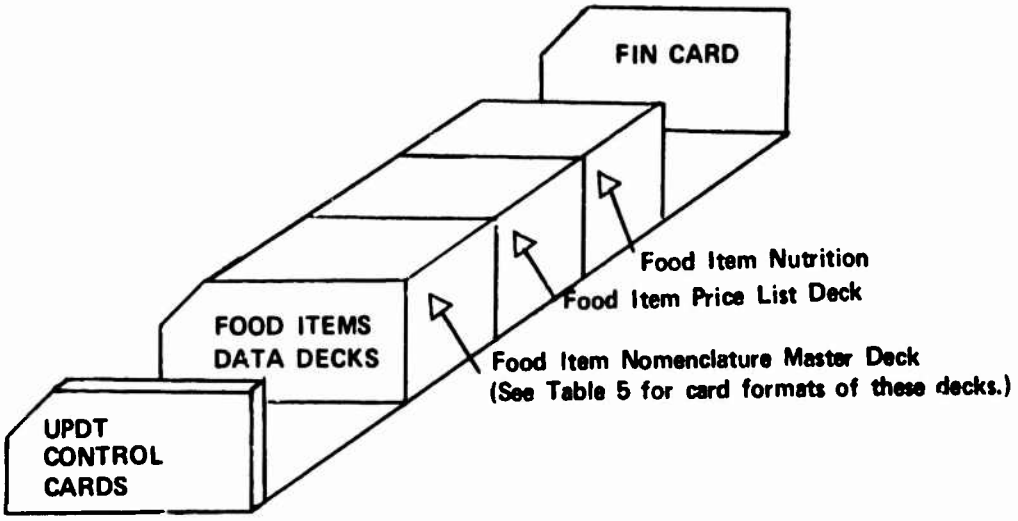
MREQ - Recipe Requirements List File

APPENDIX B – SAMPLE RUNSTREAMS

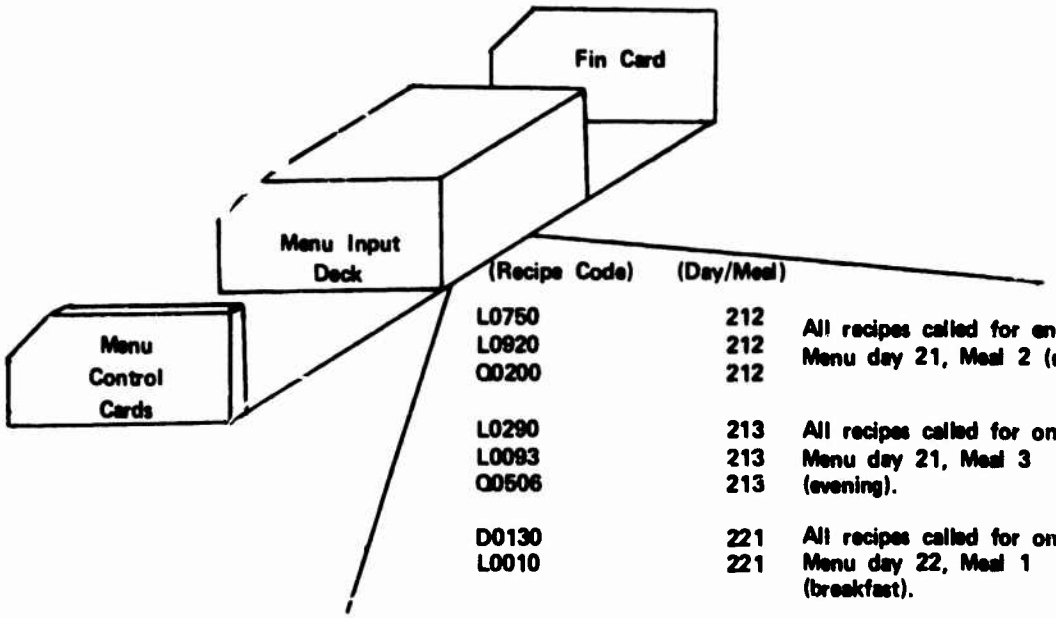
File Maintenance Detail Recipe/Ingredient Progran



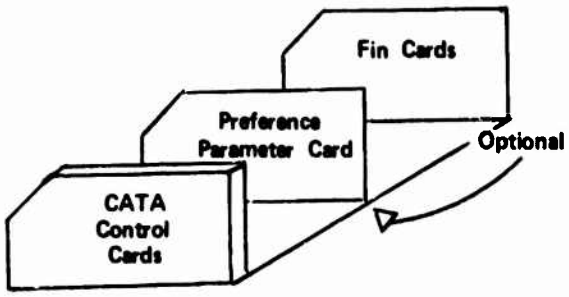
Update Program

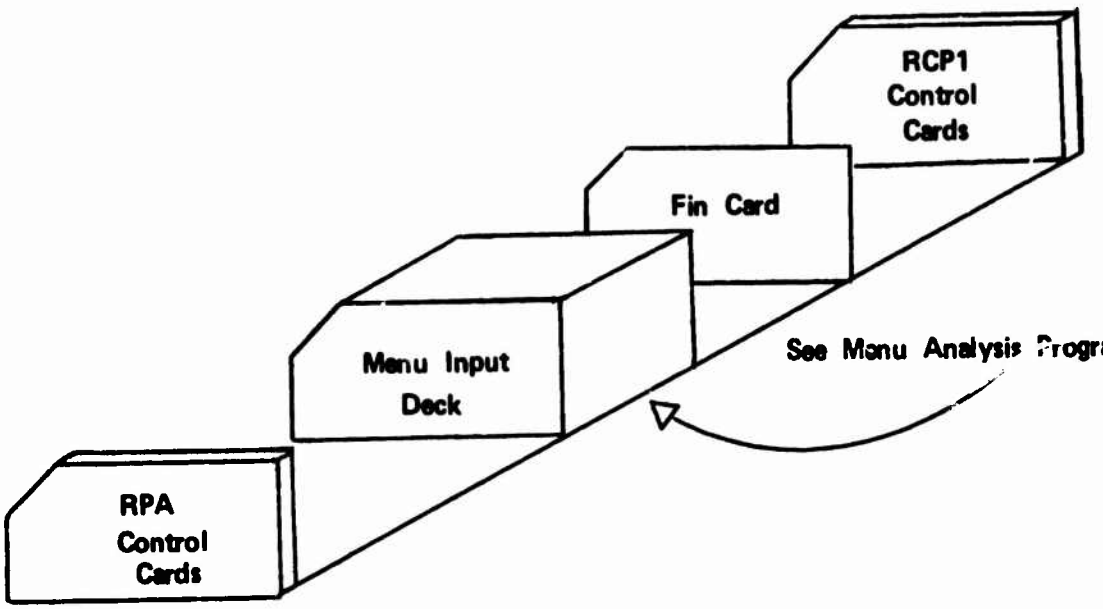


Menu Analysis Program



Menu Category Analysis Program




RCP1
Control
Cards
Fin Card
Menu Input
Deck
RPA
Control
Cards
See Menu Analysis Program run steam.